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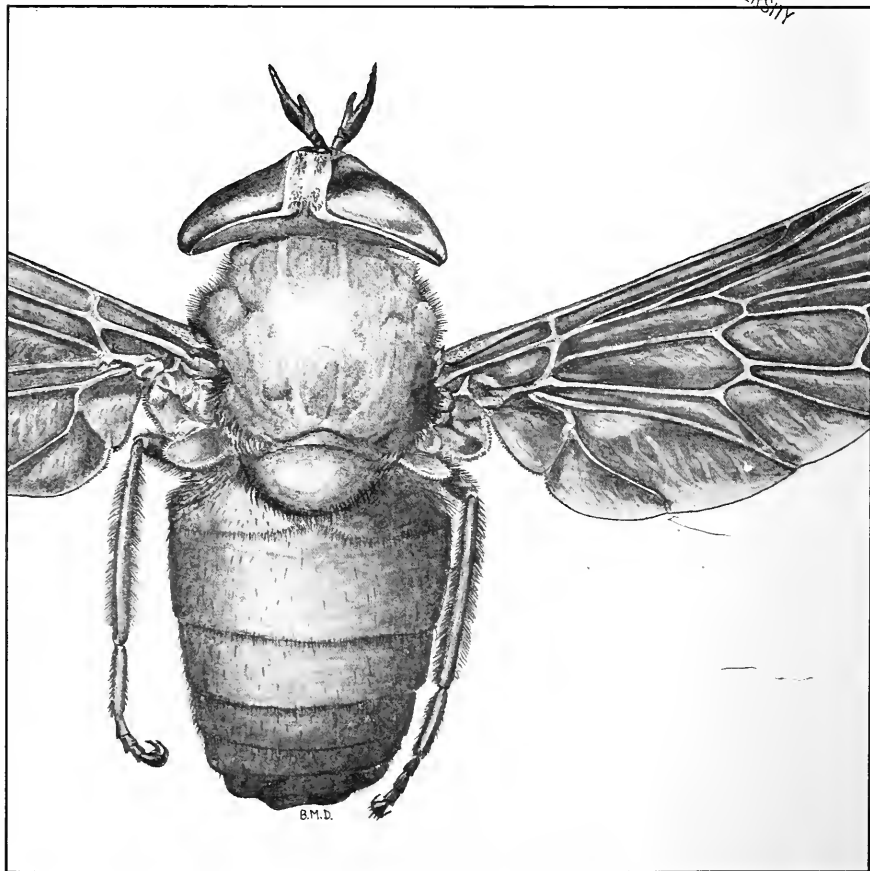
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Horse Flies and Deer Flies of West Virginia: An Illustrated Key (Diptera, Tabanidae)

Bulletin 674
June 1980

West Virginia University
Agricultural and Forestry Experiment Station

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**Horse Flies and Deer Flies of
West Virginia:
An Illustrated Key
(Diptera, Tabanidae)**

**Bastiaan M. Drees
Linda Butler
L. L. Pechuman**

ABSTRACT

Intensive collection of Tabanidae was conducted throughout West Virginia from 1975 through 1978. These records, plus those previously published and those recorded from specimens in various private and institutional collections, now account for a total of 68 species and sub-species in nine genera known for the state. Collection data and keys are given for these species, plus an additional 52 species that may eventually be taken in West Virginia.

ACKNOWLEDGMENTS

The authors are sincerely grateful to all those individuals who have contributed their specimens and collection records of tabanids during the course of this study. Particularly, we wish to thank Jan D. Hacker of the West Virginia Department of Agriculture and his WVDA co-workers who provided invaluable collection assistance. Also we express appreciation to the West Virginia University graduate students and staff in entomology from 1975-1978 for their interest and contributions to this project.

The illustrations for this publication could not have taken on their final form without the support and facilities at the Acarology Laboratory, Ohio State University, under the direction of Dr. D. E. Johnson. We are grateful also to the curators of the Ohio State University entomological collection for providing specimens for illustration.

West Virginia University
Agricultural and Forestry Experiment Station
College of Agriculture and Forestry
Dale W. Zinn, Director
Morgantown

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Horse Flies and Deer Flies of West Virginia: An Illustrated Key (Diptera, Tabanidae)

Bastiaan M. Drees, Linda Butler, and L. L. Pechuman

INTRODUCTION

Horse flies and deer flies of the dipterous family Tabanidae are important haematophagous insects. Adult feeding habits present a problem to man and animals since these flies often approach noisily and bite viciously. Several tabanid species have also been shown to transmit diseases mechanically from sick animals to healthy ones. Because of the importance of tabanids, most states have devoted some effort to becoming familiar with them. This is a necessary step in recognizing problem areas and the need for control. Until recently the tabanid fauna of West Virginia had virtually been ignored.

Most tabanid literature can be classed as systematic or biological, but many statewide and regional surveys include various mixtures of both. Major taxonomic works on adult Tabanidae include those by Brennan (1935), Stone (1938), Mackerras (1954), Philip (1941, 1965), and Fairchild (1969). Teskey (1969) summarized the available taxonomic information for the known tabanid larvae in the eastern United States. Immature stages of many tabanids found in West Virginia were described by Goodwin (1972, 1973a, b, c, 1976a), Roberts and Dicke (1974), Tidwell (1973), Tidwell and Tidwell (1973), and Teskey and Burger (1976). The systematic listing employed here includes recent additions by Pechuman (1974) and Pechuman and Teskey (1967), and is in agreement with the unpublished check list of Pechuman (1975).

Although no comprehensive work includes all aspects of tabanid biology, much information was compiled by Hine (1906), Webb and Wells (1924), Philip (1928, 1931), Stone (1930), Schwardt (1936), Tashiro and Schwardt (1949, 1953a, b), Frost (1953), and Anthony (1960). General texts (Chvala *et al.*, 1972; Oldroyd, 1964) often include extensive sections on tabanid biology. However, the biology and behavior of many tabanid species have not been described, and thus an effort has been made to include observations noted during the course of this study.

Tabanids are known vectors of many diseases (Chvala *et al.*, 1972; Howell *et al.*, 1941; Knowlton and Rowe, 1934; Krinsky, 1976; Stein *et al.*, 1942; Philip, 1931; Stone, 1938; and James and Harwood, 1969). In the opinion of Woodson (pers. com.) of the West Virginia University Division of Animal and Veterinary Sciences, biting flies, including tabanids, are the primary vectors of anaplasmosis of cattle in West Virginia. In 1975 the United States Department of Agriculture tested 12,604 horses in West Virginia for equine infectious anemia.

Forty-one positive tests were reported (USDA, 1975). This disease was shown by Stein *et al.*, (1942) to be transmitted by *Tabanus sulcifrons*, the stable fly, *Stomoxys calcitrans* (L.), and by injection of infected blood into a healthy animal. They concluded that horse flies transmit disease more readily than stable flies due to the greater size of the mouthparts.

In addition to transmitting disease, Tabanidae are of considerable importance for the annoyance and blood loss produced by their feeding activities (Philip, 1931; Stone, 1938; Tashiro and Schwardt, 1949, 1953b; Jones and Anthony, 1964; Webb and Wells, 1924). Unfortunately, computation of economic losses resulting from the summation of tabanid activity is very difficult. Various estimates have related lowered milk production (Philip, 1931) and weight loss or mortality to the feeding activities of the female flies. Other insects may be attracted to the open wounds resulting from tabanid feeding, increasing the possibility of secondary bacterial infections or fly maggot infestations (Stone, 1938). Roberts *et al.* (1969) found eye gnats, which may be vectors of conjunctivitis, yaws, and bovine mastitis, to be attracted to tabanid wounds. In West Virginia, estimates of economic losses caused by Tabanidae have not been attempted.

Published references to West Virginia Tabanidae are few. Early "Virginia" records may in fact be from West Virginia, which was part of Virginia until 1863 (Clark and Clark, 1951). Many published records of West Virginia tabanids give only the location "W. Va.," omitting county and date citations. Brennan (1935) was the first to report *Goniops chrysocoma* and *Chrysops moechus* from the state. Stone (1938) mentioned *Hybomitra miniscula* from "W. Va.," but the source of this record was not given. Philip (1947) summarized records of Brennan and Stone but added *Tabanus molestus*, *T. similis*, and *T. sulcifrons*. No further information appeared until 1966 when Philip reported *Chrysops carbonarius* as a new state record. The following year, two specimens from West Virginia were designated by Pechuman and Teskey (1967) as paratypes of the newly described *Chrysops calvus*. Fairchild (1975) described *Silvius giganulus weemsi* from specimens collected by Weems at Cranberry Glades. This subspecies is the only tabanid described from the state. Pechuman (1973), in his studies of Virginia tabanids, mentioned the occurrence of *Stonemyia tranquilla*, *Chrysops lateralis*, *Hybomitra miniscula*, *H. typhus*, and *Tabanus marginalis* in "the neighboring state" of West Virginia.

Recent additions to our information of the tabanid fauna of West Virginia have been made by Allen and Pechuman (1977) and Hacker *et al.* (1979).

Many species were suggested as occurring in this state by the catalog of Philip (1947), especially those species for which he cited records from all of the surrounding states. The current study makes reference to published accounts of species occurring in other states (Pechuman, 1972, 1973; Allen and Pechuman, 1975, 1976, 1977; Frost and Pechuman, 1958; Thompson, 1967a, b, 1969, 1971; Hine, 1903; Townsend, 1955; Brimley and Sherman, 1904; Brennan, 1935; Stone, 1938; Philip, 1947, 1965; Brimley, 1922; Ezell *et al.*, 1974; Burnett *et al.*, 1978; MacCreary, 1940, 1963; Daecke, 1907 and Jones and Anthony, 1964, plus unpublished records of Pechuman) to enable one to speculate more accurately as to the probable existence of additional species not yet reported from West Virginia.

METHODS AND MATERIALS

The objective of this study has been to formulate a concise and accurate picture of Tabanidae in West Virginia. The literature search and review of West Virginia specimens existing in various private and museum collections by Pechuman (unpublished records) has produced information of historical interest, and has aided in defining seasonal and geographic distribution of tabanid species. However, extensive collecting throughout the past four years has added much to our knowledge of the tabanid fauna of the state.

Statewide tabanid surveys have generally utilized several collecting methods which "enable well-defined temporal distributions of dominant species and indicates the presence of occasional and rare forms" (Thompson, 1967a). Collection methods have been reviewed by Frost and Pechuman (1958), Jones and Anthony (1964), Thorsteinson *et al.* (1965, 1966), and Thompson (1969). Several methods were employed in the current study in order to remove as much collecting bias as possible. Thus, sweep nets, canopy traps, malaise traps, blacklight traps, and larval collecting sieves were utilized. Specimens were also collected from inside automobiles and other enclosed areas such as barns, greenhouses, and porches.

Collection of adults with aerial nets at specific sites of tabanid activity, including sunny spots, puddles in roads, swampy areas with vegetation, flowers, tree sap, aphid exudates, and warm-blooded animals, has historically been the most basic survey method. This method was discussed by Philip (1931) and McAtee and Walton (1918) as it has been important in comparing state survey methods and in capturing specimens for species verification following biological and behavioral observations. Aerial nets were used extensively throughout this study as they are by far the most productive tool for capturing *Chrysops* specimens, males, and members of the genera *Goniops* and *Stenomyia*, which are not attracted to warm-blooded animals.

Blood-feeding females of the rapidly flying genera, *Tabanus*, *Hybomitra*, and *Atylotus*, are best captured in modified canopy or malaise traps. The canopy or Manitoba trap was used in studies by Hanecand Bracken (1964), Matthyse *et al.* (1974), and Thompson (1967a). Modifications resulting from finds by Wilson *et al.* (1966), Thorsteinson *et al.* (1965, 1966), and Snoddy (1970) were incorporated into the canopy trap by Thompson (1969) and Adkins *et al.* (1972). The same modifications, including the use of dry ice for the generation of CO₂ and a beach ball painted shiny black, may also be incorporated into malaise traps such as those used by Roberts (1970a, b), Pechuman and Burton (1969), or Fairchild (pers. com.). Thompson (1969) observed that Manitoba or canopy traps were most effective in open areas near water, and within hardwood or hardwood-conifer swamps, less effective in open areas near pastures and old fields, and least effective within a dense forest canopy.

Malaise traps constructed and employed during the course of this study were of the type pictured in Pechuman (1972) and were more easily and cheaply constructed than those of Townes (1962). The nets were made from green nylon army surplus tent mosquito netting. Two pieces, each 4 × 15 ft., were sewn together to form a single net 8 × 15 ft. Along the top edge, another 15-ft. long piece of netting was sewn forming a canopy with 2 ft. wide sides. In a similar operation, vertical baffles were added at each end of the trap. Grommets were placed at the corners of the net and at the junctions of the baffles and canopy, enabling the trap to be suspended between two 9 ft. × 1 in. × 1½ in. oak poles (Fig. 1). When not in use, the nets were rolled around the poles for easy transport on an automobile roof rack. During this study, the malaise traps were frequently modified by the addition of a black enameled beach ball and dry ice suspended from the canopy in a nylon mesh bag. These traps have proven to be highly successful in most areas, including densely wooded areas characteristic of much of West Virginia. Part of this effectiveness is explained by Roberts (1974), who studied flight heights of several Tabanidae. He observed that few tabanids fly higher than 8 ft. from the ground. Pechuman (1972) also mentioned that unlike canopy traps, the malaise trap collects male specimens, an observation verified during this study.

Blacklight traps (Elisco®) (BLT) were operated at several locations around the state. Two light traps located at the West Virginia University Horticulture and Plant Sciences farm in Morgantown were operated continually from March to November each year throughout this study.

MacCreary (1940) and Philip (1928) mentioned the collection of larvae as an important part of surveys. They found that larvae commonly collected in the field are often species not commonly caught as adults (e.g., *Tabanus reinwardtii*). Collecting methods for larvae were reviewed by Philip (1928). Sieves of several sizes and mesh

sizes were tested with minimal success during this study. The best method for extracting larvae from most substances was the utilization of a tool such as a garden rake, a trowel, or a hand ax in sorting through the substrate *in situ*. Since tabanid larvae are, in general, much more time consuming to collect than are adults, only minimal effort was made with larval sampling during this study.

RESULTS AND DISCUSSION

Classification

Records of West Virginia Tabanidae to date represent 68 species and sub-species from the 9 genera listed below. Numbers in parentheses represent the total number of species which may actually occur within the state.

Stonemyia	1	(3)
Goniops	1	(1)
Merycomyia	0	(1)
Silvius	1	(2)
Chrysops	24	(45)
Neochrysops	0	(1)
Diachlorus	0	(1)
Microtabanus	0	(1)
Chlorotabanus	0	(1)
Leucotabanus	1	(1)
Haematopota	1	(1)
Atylotus	3	(4)
Hamatabanus	0	(1)
Hybomitra	8	(13)
Tabanus	28	(44)
Totals	68	120

Index of Abundance

In order for the tabanid species of West Virginia to be rated in sequence from the most abundant to least abundant, a mathematical formula was developed to consider factors important in evaluating one species relative to another. Frost and Pechuman (1958) attempted such a rating of the more abundant species in Pennsylvania by simply listing in decreasing order the number of specimens collected during their survey, along with a listing of the number of county records. However, the number of county records obtained for each species did not follow the same decreasing order as did the number of specimens collected. Tashiro and Schwardt (1953b) also gave a listing of the relative abundance in decreasing order of New York Tabanidae using the values of percentage of species represented in the total population swept from one side of an animal for "short but definite periods of time." Obviously, any system of rating tabanids will be biased by the units of measurement employed.

West Virginia has 55 counties. Core (1966) divided the state into six geographical zones, roughly approximating four topographical regions (Fig. 2). The Index of Abundance was computed for species collected in West Virginia during the 1975 and 1976 collecting seasons using three variables: (1) the number of specimens obtained through all collection methods during this study, (2) the number of county records, and (3) the number of geographical zones represented by each species. The values obtained do not reflect fluctuation of seasonal population levels characteristic of most species.

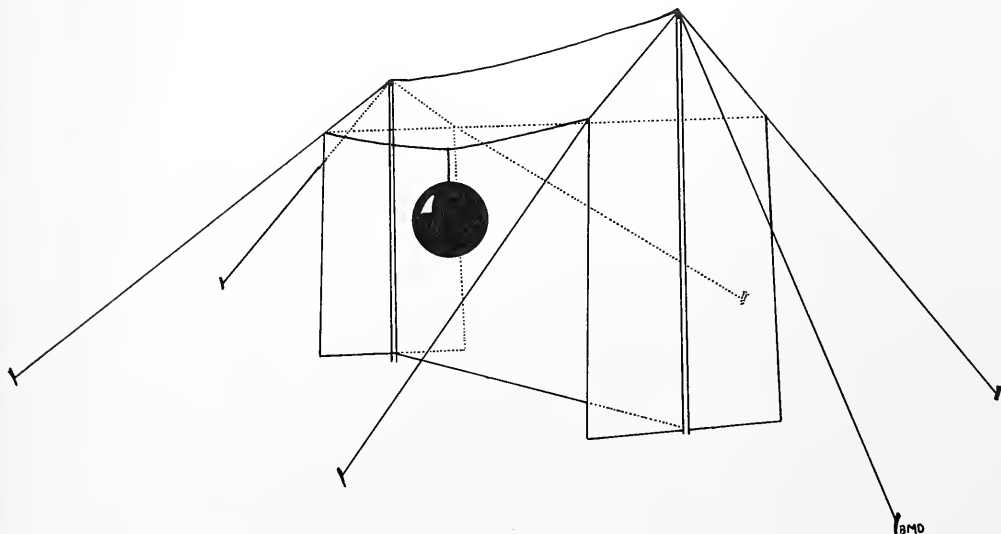
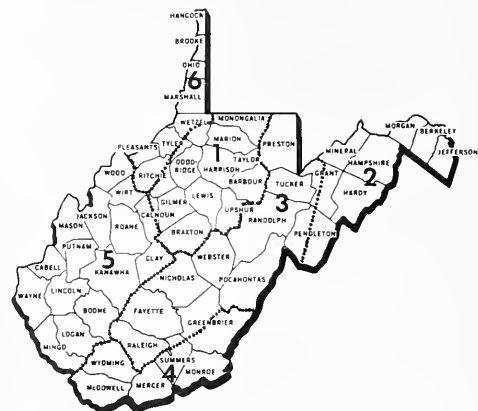


Figure 1. Modified malaise trap employing shiny black enamelled sphere.



- 1-North Central 4-Southern
 2-Northeastern 5-Southwestern
 3-Central 6-Northwestern

Figure 2. Map of West Virginia showing the placement of the 55 counties and the division of the state into six geographical regions (Core, 1966).

The collecting methods have imposed a generic bias since, in contrast to *Chrysops*, very few *Tabanus* and *Hybomitra* were collected in aerial nets. Therefore, it was deemed unadvisable to relate index values for *Chrysops* to those of *Tabanus* and *Hybomitra*; thus, two separate figures are presented to indicate abundance of these genera (Figs. 3, 4).

The variables were converted to percentages of their highest possible values. For example, there are six geographic zones given for West Virginia (Core, 1966) and thus, a species may attain a value of 16.6, 33.3, 50.0, 66.6, 83.3, or 100 percent if they are known from 1, 2, 3, 4, 5, or 6 geographical zones, respectively. No species was recorded from more than 18 of 55 counties, and not more than 225 specimens of one species were collected during the 1975 and 1976 seasons of this survey. Thus, 18 and 225 are the maximum values and were used to calculate percent values for the last two variables. The resulting values are averaged together to obtain the Index of Abundance value for each species.

$$\text{Index of Abundance Value for one species} = \frac{\text{No. of specimens} + \frac{\text{No. of county records}}{18} + \frac{\text{Geographic zones}}{6}}{3} \times 100$$

Inherent to this method is the effect of each variable on the Index value. Since this is a statewide survey, it is more

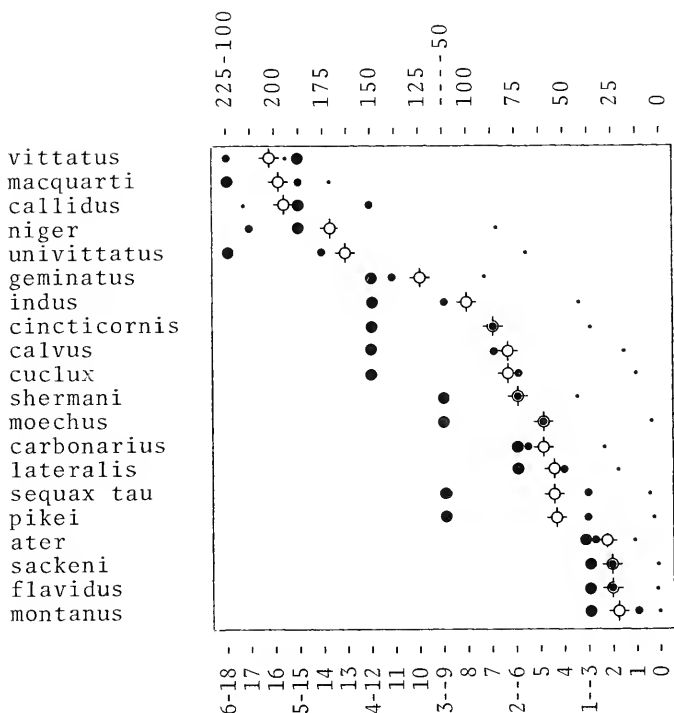
important for a species to have records from several geographical zones than to have been collected in several counties in a single zone. Since collecting records result in three values which are all measures of distribution in area, the value for the number of specimens comprises less than one-third of the calculated Index value. The resulting Index of Abundance values have been plotted in decreasing order for *Chrysops* species in Figure 3 and for *Tabanus* and *Hybomitra* species in Figure 4. Values of the three variables used to calculate the Index values are also shown.

The Index of Abundance values clearly show the most widely distributed and commonly collected Tabanidae in West Virginia. The six *Chrysops* receiving the highest Index values are *C. vittatus*, *C. callidus*, *C. niger*, *C. univittatus*, *C. macquarti*, and *C. geminatus*. The five most highly rated *Hybomitra* and *Tabanus* are *T. quinquevittatus*, *H. lasiophthalma*, *H. difficilis*, *T. sackeni* and *T. sulcifrons*. This list of tabanids contains most of the same species listed by Frost and Pechuman (1958) except for the substitution of *C. geminatus* and *C. univittatus* in West Virginia for *C. shermani* and *C. indus* in Pennsylvania. Both the latter species are primarily northern in distribution and are common only at higher elevations in West Virginia.

The term "abundance" now applies to numbers of specimens, county records, and geographic zone records. Methods of estimating species abundance using only numbers of specimens collected sometimes reflect the results from only a few successful collection locations. For example, *Hybomitra miniscula* was taken only twice during the 1975-76 seasons; all specimens were collected in and around sphagnum bogs. In one day a series of 56 specimens was captured at one location. The large numbers of specimens may have been due to several factors but they cannot be attributed to the distribution of this species at that time. Another species, *Hybomitra pechumani*, has never been found in large numbers; only 18 specimens were collected during the study period. However, it was collected from five counties representing three of the geographic zones. Obviously, this species is much more widespread and common in areas not associated with sphagnum bogs and thus is probably more abundant in the state. Most important, the Index of Abundance values are meaningful only because they are relative to values calculated for other species.

The Index of Abundance ratings cannot be considered as a true measure of economic importance. With regard to livestock blood loss, several large tabanids (e.g., *Tabanus sulcifrons*) can draw much more blood and leave larger wounds than can a larger population of smaller (e.g., *Chrysops*) species. Thus, larger tabanids may be more important in smaller numbers than some of the more numerous but smaller species. Also, the behavioral response of livestock to the sound of attacking larger tabanids may be much more detrimental than that of many smaller species. Although most tabanids are

1-100 = Index of Abundance
 1-225 = Total Specimens/Species



1-6 = Geographical Zones
 1-18 = County Record Total/Species

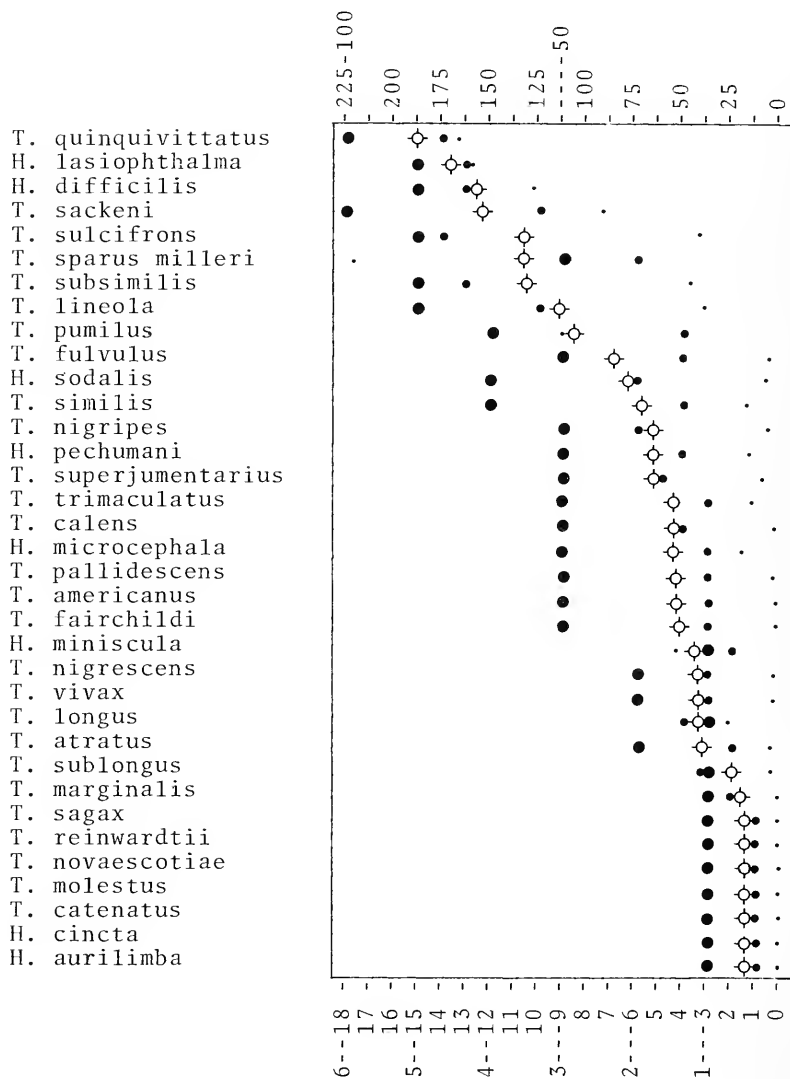
Index to Figures 3 & 4

- = Total number of specimens examined
- = Total county records
- = Total geographical zone records
- ◇ = Index of abundance

$$\diamond = \frac{\frac{\bullet}{225} + \frac{\bullet}{18} + \frac{\bullet}{6}}{3} \times 100$$

Figure 3. Index of abundance rating for 20 species of West Virginia *Chrysops* as determined from number of specimens, number of county records, and number of geographical zone records.

1-100 = Index of Abundance
 1-225 = Total of Specimens/Species



1-6 = Geographical Zones
 1-18 = County Record Total/Species

Figure 4. Index of abundance rating for 35 species of West Virginia *Tabanus* and *Hybomitra* as determined from number of specimens, number of county records, and number of geographical zone records.

capable of spreading diseases mechanically, those with larger mouthparts are capable of transmitting greater quantities of pathogens and thus may be more important vectors. However, if one species is known to be the vector of a particular disease (e.g., *Chrysops discalis* and tularemia or deer-fly fever), it can be very important, even in small numbers.

Finally, the less commonly collected "rare" species, those with low Index of Abundance values, may not be at all rare or limited in distribution. Species response to collecting methods may be greatly biased due to behavioral idiosyncrasies, including habitat and oviposition preferences, host preferences, short flight seasons, and meteorological factors affecting activity. These factors should be considered with regard to the status of West Virginia Tabanidae and their Index of Abundance values.

Taxonomy, Distribution, and Habits

Keys to species of West Virginia Tabanidae and short taxonomic discussions are given in the following sections. In some cases (*Chrysops*, *Hybomitra*, and *Tabanus*), keys to males as well as females are provided because of frequent dimorphism. Males are quickly distinguished from females by their contiguous eyes. Following the keys and taxonomic discussions are alphabetical listings of the species with distribution records, information on known distributions, and peculiar forms or habits observed during this study.

Specific names of tabanids are followed by the name of the author. The "seasonal range" consists of extreme dates of capture of the species in West Virginia, followed in parenthesis by extreme dates of capture of the species in states near West Virginia. Extreme dates for the surrounding states are not given where West Virginia records exceed them.

"Distributional records" include alphabetically listed county names in capital letters, specific locations, date of capture, initials of collectors, and initials of the collections where the specimens are housed. Where initials of the collector appear twice, the collector is in possession of the specimens.

Names and Initials of Collectors

J. Amrine	JA
D. Barger	DB
R. Barrat	RB
J. W. Begley	JWB
E. Bostic	EB
J. C. Bradley	JCB
S. W. Bullington	SB
J. Burger	JB
L. Butler	LB
P. Calise	PC
C. C. Coffman	CC
A. E. Cole	AC
R. DeHaven	RD

B. M. Drees	BD
R. M. Dunst	RMD
E. Estep	EE
K. Elrod	KE
S. Fink	SF
H. Fischer	HF
D. Fisher	DF
W. Flowers	WF
P. Francis	PF
P. Garret	PG
J. D. Hacker	JH
J. H. Hall	JHH
D. Harris	DH
P. D. Harwood	PH
K. Hinkley	KH
R. Johnson	RJ
W. T. Johnson	WJ
T. Keeney	TK
K. V. Krombein	KK
G. M. Kutchka	GK
R. Lindsey	RL
G. Lippert	GL
R. Marter	RM
T. L. Mason	TM
W. Mathews	WM
H. Menke	HM
H. M. Milliron	MM
J. McCabe	JM
K. McDonald	KM
B. Nierwienski	BN
W. Northeimer	WN
H. Palestine	HP
L. M. Peairs	LMP
L. L. Pechuman	LLP
F. L. Pogge	FP
G. Post	GP
C. Power	CP
F. Ramberg	FR
W. Robinson	WR
S. A. Rohwer	SR
C. W. Sabrosky	CWS
C. V. Stafford	CVS
C. Stuart	CS
P. Swope	PS
R. Swope	RS
H. Teskey	HT
P. H. Thompson	PT
R. J. Thompson	RT
P. Van Buskirk	PV
J. Vandevender	JV
D. Vest	DV
G. E. Wallace	GW
H. V. Weems	HW
R. White	RW
J. Wilhelm	JW
M. Winters	MW
R. Winters	RW ¹

Names and Initials of Collections

Carnegie Museum of Natural History	CM
Cornell University	CU
Florida State Collection of Arthropods	FSCA
Harvard University	HU
Kansas State University	KSU
Michigan State University	MSU

North Dakota State University	ND
Ohio State University	OSU
University of Arkansas	UA
U.S. National Museum	USNM
Virginia Polytechnic Institute and State University	VPI
West Virginia Department of Agriculture	WVDA
West Virginia University	WVU

KEY TO GENERA OF WEST VIRGINIA TABANIDAE

The family Tabanidae can be separated from other dipterous groups by the presence of three freely articulated antennal segments, pulvilliform empodia with three tarsal pads, conspicuous calypters, and a closed anal cell. The third longitudinal vein is divergent and its upper and lower branches enclose the wing tip; the anal vein is straight or slightly curved (Borror *et al.*, 1976).

There are few distinguishing characters in Tabanidae. Much dependence has been placed on color pattern, making it difficult to determine greasy or partly denuded specimens. Many of the distinguishing characters are confined to the head and its appendages. Figures which appear throughout the keys illustrate the more important taxonomic characters. These figures were redrawn from camera lucida drawings made by the first author from

specimens in his possession from WVU and OSU collections and from the collection of L. L. Pechuman and Cornell University. Where specimens were unavailable, the figures were redrawn from the original species descriptions by Fairchild (1975), Hine (1912), Stone (1938), McAtee and Walton (1918), Brennan (1935), and Pechuman and Teskey (1967). Characters which are illustrated in the keys should not be used to the exclusion of other characters in the couplet. Abdominal patterns are figured for many species. These patterns may vary with respect to the proportion of light to dark colors, but the overall designs usually remain constant. The species keys and figures have been integrated into the state records and discussions in order that specific information can be more easily located.



1. a. Hind tibia with 2 apical spurs (as)

..... 2

- b. Hind tibia without apical spurs

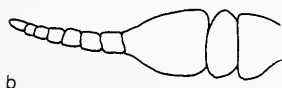
..... 7



a

2. a. Third antennal segment (3) with five or less distinct annuli

..... 3



b

- b. Third antennal segment with 8 distinct annuli

..... 6



a

3. a. Third antennal segment composed of a rather broad basal plate (bp) and 2 or 3 annuli; first antennal segment only slightly longer than wide and total length of antenna equal to or shorter than thickness of head; larger (over 15mm). *Tabanus*-like species without definite wing pattern; very small hind tibial spurs

..... *Merycomyia*



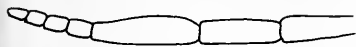
b

- b. Third antennal segment composed of five annuli, terminal four annuli distinctly shorter and narrower than the first

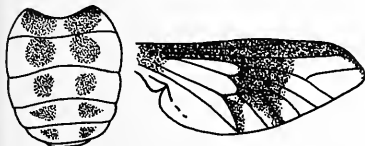
..... 4



a



b

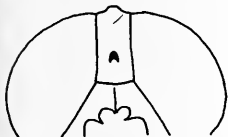


a

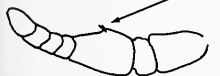
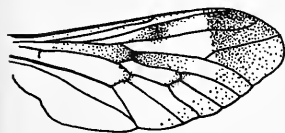
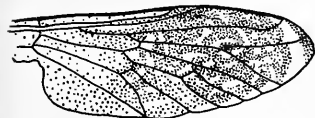
b



a



b



4. a. Second segment of antenna about half as long as first; mostly yellow or yellowish species

..... *Silvius*
(page 16)

- b. Second segment of antenna more than half as long as first, often nearly as long

..... 5

5. a. Abdomen globose, wider than thorax, with 2 rows of dark spots; wings rather evenly fumose

..... *Neochrysops*
(page 37)

- b. Abdomen slender and variously marked or unpatterned; wings with definite light brown to black patterns

..... *Chrysops*
(page 16)

- 6.(2)a. Eyes of female with upper angles acute; frons (f) broader than width of eye; wings with dark pattern

..... *Goniops*
(page 15)

- b. Eyes of female normal; frons narrower than width of eye; wings hyaline

..... *Stonemyia*
(page 15)

- 7.(1)a. First antennal segment longer than wide; frons of female widened below, broader than high; wing gray with white maculations

..... *Haematopota*
(page 37)

- b. First antennal segment usually scarcely longer than wide; frons of female higher than broad; wing pattern, if any, not as above

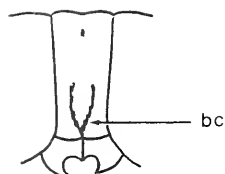
..... 8

8. a. Third antennal segment with no dorsal angle (da); frons of female narrow; median callus a narrow line; wings with a dark pattern; eyes bare; no ocellar tubercle; fore tibiae swollen; basicosta (subepaulets) bare

..... *Diachlorus*
(page 37)

- b. Not with this combination of characters

..... 9



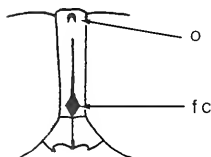
9. a. Third segment of antenna with 2 or 3 annuli and with articulations indistinct; small flies usually under 10mm; basal callus (bc) of female small or absent

..... *Microtabanus*
(page 37)



- b. Third segment of antenna with 4 distinct annuli; size variable, usually more than 10mm; frontal callus present or absent

..... 10



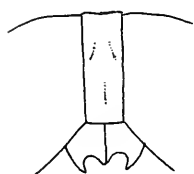
10. a. Small but distinct ocelli (o) present; frons narrow; frontal callus (fc) narrow and ridgelike, well removed from eyes

..... *Leucotabanus*
(page 37)



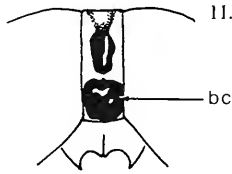
- b. No ocelli, but an ocellar tubercle may be present; frons, and callosities if present, variable

..... 11



11. a. Frontal callosities lacking

..... 12



- b. Frons with at least a basal callus (bc)

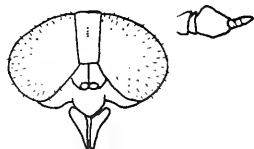
..... 13

a

b

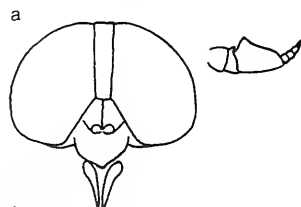
12. a. Eyes hairy; labella fleshy; dark yellowish, gray or brownish species

..... *Atylotus*
(page 38)



- b. Eyes bare; labella with sclerotized plates; greenish species in life

..... *Chlorotabanus*
(page 37)



13. a. Third antennal segment with a hooklike projection from basal plate nearly reaching base of annulate portion; eyes sparsely hairy

..... *Hamatabanus*
(page 39)

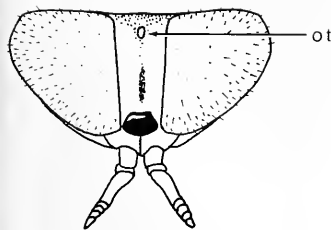


- b. Third antennal segment rarely with such a projection but if present, eyes bare

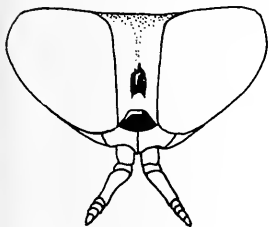
..... 14



b



a



b

14. a. Vertex with a distinct denuded ocellar tubercle (ot) in female; male with an elevated anteriorly shining tubercle; eyes usually hairy

..... *Hybomitra*
(page 39)

- b. Vertex of female without an ocellar tubercle; if an elevated tubercle is present in the male, it is completely pollinose; eyes bare or hairy

..... *Tabanus*
(page 44)

Subfamily PANGONIINAE

Tribe Pangoniini

Genus *STONEMYIA* Brennan

Species of this genus are not known to suck blood, being found only on flowers or resting on the ground in

open areas. The three species which should occur in West Virginia are not common, nor is anything known of their biology. They can be distinguished as follows (Pechuman, 1972):

1. a. Antennae, legs, and body overall yellowish
..... *isabella* (Wiedemann)
- b. Antennae, at least partly dark; legs reddish to black
..... 2
2. a. Legs reddish brown; posterior margins of abdominal segments with grayish hair
..... *rasa* (Loew)
- b. Legs black; posterior margins of abdominal segments with yellow hair
..... *tranquilla* (Osten Sacken)

Stonemyia isabella (Wiedemann)

This species is not yet known from West Virginia but has been found in all of the neighboring states between 12 June and 31 July.

Stonemyia rasa (Loew)

As a northern species, *S. rasa* should be found in the central highlands of West Virginia. Specimens have been collected in all the surrounding states except Kentucky between 12 June and 7 August.

Stonemyia tranquilla (Osten Sacken)

Seasonal Range—26-VII to 6-VIII (13-VII to 21-VIII). Distribution—RANDOLPH, Roaring Plains, 26-VII-76, LB and BD, WVU.

POCAHONTAS to RANDOLPH, Cheat Mt., 6-VIII-60, MM, CM.

This species is northern but ranges south to northern Georgia in the mountains. It is found in mountainous areas of West Virginia.

Drees and Butler found this species abundant on flowers in RANDOLPH. Frost and Pechuman (1958) also reported capturing many specimens from flowers of *Spiraea latifolia*. More females than males were taken, and a few males were observed as prey of crab spiders (Thomisidae).

Tribe Scionini

Genus *GONIOPS*

Goniops chrysocoma (Osten Sacken)

Seasonal Range—29-V to 30-VIII (13-V).

Distribution—BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 8-VI-77, HT, HT.

GREENBRIER, White Sulfur Springs, 11-VIII-12, WR, USNM (Philip, 1941). HARDY, Lost River State Park, 19-VII-74, HM, USNM (as prey of *Crabo monticola* det. Thompson). MONONGALIA, Coopers Rock State Forest, 30-VIII-75, JA, WVU. PRESTON, Chestnut Ridge, 1974, WM, WVU (larva). PUTNAM, VI-76, DH, WVU. TUCKER, Blackwater Falls State Park, 14-V-76, LB, WVU (larva). WETZEL, Lewis Wetzel Public Hunt. and Fish. Area, 18-VI-76, LB and BD, WVU (larva). WOOD, 7-VII-75, TM, TM.

This species has a general distribution from Ontario south to AR and SC (Philip, 1965), especially in forested areas. Larvae are terrestrial, being found in leaf litter and soil of hardwood forests. The larva collected in TUCKER was found in a decaying beech tree well above soil level. This habitat seems to be unique and unreported.

The specimen from HARDY recorded as prey of *Crabo monticola* (Hymenoptera: Sphecidae) is the only confirmed predator-prey record of a West Virginia tabanid.

Subfamily CHRYSOPINAE

Tribe Chrysopini

Genus SILVIUS

All nearctic species are western in distribution except *Silvius gigantulus weemsi* Fairchild. *S. quadrivittatus* (Say) may also be found in West Virginia in the future and may be distinguished as follows (Brennan, 1935):

- a. Wings maculate; species gray; costal cell hyaline; frontal callus about half the width of frons, broadly separated from eyes; branches of the third longitudinal vein with apical spots

.....*quadrivittatus* (Say)



- b. Wings immaculate; species yellow; frontoclypeus partially denuded; abdominal tergites without median triangles

.....*gigantulus* (Loew)

Silvius gigantulus weemsi (Fairchild)

Seasonal Range—12-VIII to (17-VIII).

Distribution—POCAHONTAS, Cranberry Glades, 12-VIII-72, HW, FSCA and colls. of Pechuman and Philip (Fairchild, 1975).

The West Virginia specimens represent an isolated eastern population of *S. gigantulus* (Loew), a species widespread in western North America. Cranberry Glades is the only known breeding location for this sub-species, although two other specimens (in poor condition) are recorded for PA (ALLEGHENY) and NY. The Weems specimens (8 females) collected in a malaise trap at an elevation of 3,400 ft. were designated holotype and paratypes (Fairchild, 1975). Males are unknown. Pechuman (pers. com.) believes the Weems specimens may represent a separate species, as they have long been isolated from the preglacial continuous population of *S. gigantulus*.

Silvius quadrivittatus (Say)

Although the nearest records of this species are from IL and TN, it appears to be expanding its range eastward and could be found in this state between 3 June and 13 August.

Genus CHRYSOPS

Deer flies are a nuisance to man but probably are less important as pests of livestock than the larger tabanids unless they occur in high numbers. Deer flies persistently attack the top of the head and neck of man, and favor the head, neck, and withers of cattle. Successful attacks are aided by the ability of these flies to approach almost noiselessly, often from downwind. Having landed, they burrow into the hair to bite, much like the smaller *Tabanus pumilus* and *T. sparus milleri*.

The deer fly season in West Virginia begins in mid-May (9 species encountered) and becomes intense in most areas during June and July (19 and 18 species encountered, respectively). Nine species have been encountered in August but, to date, no *Chrysops* have been reported during September. Pechuman (1972) has determined the main seasonal occurrence of most species to be rarely over two weeks, although isolated specimens may be found throughout the season. Evidence also indicates a bivoltine cycle for some species. No *Chrysops* have been found to have a life cycle of more than one year.

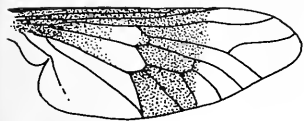
The following keys are based primarily upon wing patterns, which, unlike eye coloration, are relatively long lasting, although a bleaching effect is noticeable in older specimens.

Because of frequent dimorphism, a separate key is given for males. Male tabanids have contiguous eyes and lack a frons. Both male and female keys are primarily modifications of those of Pechuman (1972, 1973, 1974).

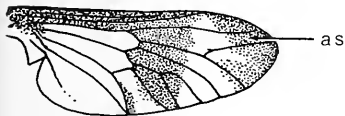
KEY TO SPECIES OF WEST VIRGINIA *CHRYSOPS*

1. FEMALES

1. a. Apex of wing beyond crossband hyaline 2

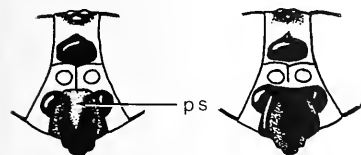


a



- b. Apex of wing infuscated so an apical spot (as) is present 11

b



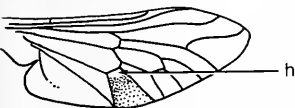
a

b

2. a. Frontoclypeus with a pollinose stripe (ps) extending from below antennae one-half or more the distance to the oral margin 3

- b. Frontoclypeus without a pollinose stripe 8

3. a. Abdomen entirely dark, sometimes with an indefinite pattern of grayish pollinose areas 4
b. Abdomen with pale areas on at least first 2 abdominal segments 7



a



b

4. a. Fifth posterior cell with hyaline (h) area at base 5

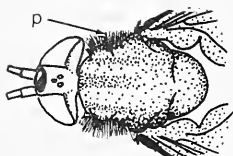
- b. Fifth posterior cell infuscated at base 6



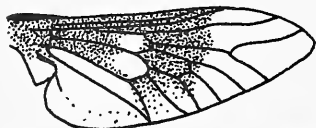
5. a. Crossband (cb) reaches hind margin of wing rather broadly, outer margin quite straight or slightly bowed; hyaline spot at base of fifth posterior cell large, distinct and clearly defined. Hairs of pleurae gray or yellowish *carbonarius* Walker



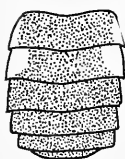
- b. Crossband usually not broadly reaching hind margin of wing, outer margin irregular; hyaline spot at base of fifth posterior cell usually not clearly defined, sometimes almost absent *ater* Macquart



6. a. Pleura (p) with yellow to orange-red pile; crossband broadly reaches hind margin of wing.
.....*cincticornis* Walker

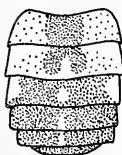


- b. Pleura with grayish or pale yellowish pile; crossband narrowly or not at all reaching hind margin of wing
.....*mitis* Osten Sacken



- 7.(3)a. Wing markings pale; pleura with gray pile; no median abdominal triangles
.....*cuctux* Whitney

(Occasional specimens of *C. mitis* have small reddish spots laterally at base of abdomen but wing picture is dark.)



- b. Wing markings dark; pleura with yellow or orange pile; median abdominal triangles present
.....*exitans* Walker

- 8.(2)a. Wing pattern pale; crossband does not reach hind margin of wing

.....9

- b. Wing pattern dark; crossband reaches hind margin of wing

.....10



9. a. Abdomen completely dark; first basal cell (bc) dilutely infuscated; crossband dilute, faint pale brown

.....*nigribimbo* Whitney



- b. Abdomen with a yellow pattern; both basal cells hyaline

.....*fulvistigma* Hine



10. a. Bare integument (bi) runs from ocellar area to occiput uninterrupted by pollinose areas; sublateral thoracic stripes very distinct

.....*calvus* Pechuman & Teskey





- b. Bare integument of ocellar area and occiput interrupted by pollinose areas; thoracic stripes indistinct

.....*niger* Macquart

- 11.(1)a. Frontoclypeus with a pollinose stripe or projection below antennae (see illustration for couplet 2a)

..... 12

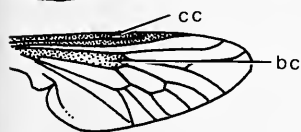
- b. No pollinose stripe or projection on frontoclypeus (see illustration for couplet 2b)

..... 15



12. a. First basal and costal cells lightly infuscated to nearly hyaline; abdomen black with middorsal yellow stripe and often shorter lateral stripes

.....*upsilon* Philip



- b. First basal cell (bc) and costal cells (cc) heavily infuscated; abdomen yellow with a black pattern

..... 13

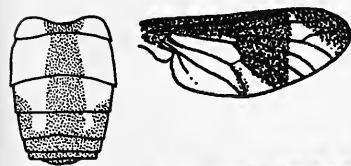
13. a. Hyaline triangle distinctly reaches or crosses second longitudinal vein

..... 14



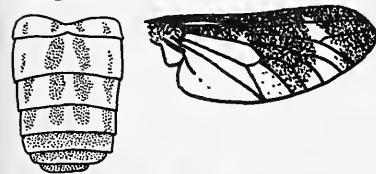
- b. Hyaline triangle (ht) does not reach second longitudinal vein (lv2); frontoclypeus usually black with median pollinose stripe; pleura with gray or yellowish pile; abdomen usually not banded but in questionable specimens, black band is not complete; hind tibia reddish yellow to black; legs often with considerable yellow, hind tibia never completely black; apical spot covers entire upper branch of third longitudinal vein

.....*frigidus* Osten Sacken



14. a. Frontoclypeus black; abdomen yellow with a single broad mid-dorsal black stripe

.....*dorsovittatus* Hine



- b. Frontoclypeus yellow; abdomen with four black stripes

.....*sequax tau* Philip



- 15.(11)a. Crossband and apical spot broken by dilute areas along veins; abdomen striate

.....*shermani* Hine

- b. Dark markings of wing not broken by dilute areas

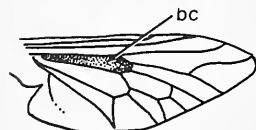
..... 16



16. a. Apical spot (as) dilutely extended around wing, reducing hyaline triangle to a subhyaline area not reaching hind margin of wing; large brown species with swollen first antennal segment and little or no trace of abdominal markings
..... *brunnes* Hine

b. Not with the above characters

..... 17



17. a. First basal cell (bc) completely infuscated, rarely with a subhyaline spot at apex

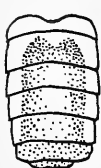
..... 18



- b. First basal cell always at least half hyaline, sometimes almost entirely so

..... 32

b

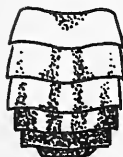


18. a. Apex of wing infuscated reducing hyaline triangle to a roundish spot largely restricted to the first submarginal cell

..... *bistellatus* Daecke

- b. Wing with a hyaline triangle (see illustration for couplet 1b)

..... 19



19. a. Hyaline triangle small but clear and distinct, restricted to apices of second and third posterior cells

..... *moechus* Osten Sacken

- b. Hyaline triangle extending toward costal margin of wing beyond second posterior cell

..... 20

20. a. Apical spot narrow, entering only upper corner of second submarginal cell; blackish species

..... 21

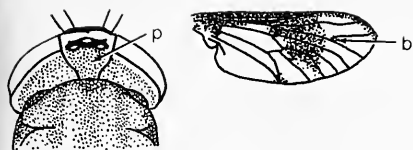
- b. Apical spot broad, usually covering at least half of second submarginal cell

..... 22



21. a. Bare integument runs from ocellar area to occiput, uninterrupted by pollinose areas; thoracic stripes distinct; apical spot a narrow line; only rarely a small spot at bifurcation (see illustration for couplet 10a)

..... *calvus* Pechuman & Teskey



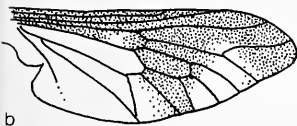
- b. Extensive pollinose (p) areas in ocellar area and occiput; thoracic stripes indistinct; apical spot broader; normally a dark spot at bifurcation (b)

.....*brimleyi* Hine



22. a. Hyaline triangle reaching and sometimes crossing second longitudinal vein (lv2) but sometimes upper portion tinted so that it is indistinct, often narrow and crescent shaped

.....23



- b. Hyaline triangle not extending much beyond the bifurcation and not crescent shaped

.....28

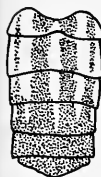


23. a. Frontal callus (fc) yellow

.....24

- b. Frontal callus black or deep brown

.....25



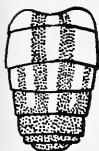
24. a. Apical spot reaches into first and sometimes second posterior cell (pc2); fifth posterior cell (pc5) usually with some infuscation; 2 central stripes of abdomen heavier and darker than lateral stripes (lateral stripes often much reduced or obsolete on first two abdominal segments), thorax often with a greenish cast

.....*hinei* Daecke



- b. Apical spot rarely reaches into first posterior cell (pc1) except as a pale shadow; fifth posterior cell usually entirely hyaline; 4 stripes of abdomen of about equal intensity or central stripes slightly accentuated; thorax between stripes bright yellow

.....*beameri* Brennan

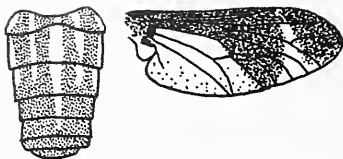


25. a. Yellowish species with abdomen conspicuously black striped; abdomen with 2 prominent submedian stripes; sublateral stripes absent on tergites 1 & 2 and sometimes 3; hyaline triangle rounded at apex

.....*pikiei* Whitney

- b. Predominantly black or fuscous species with pale abdominal markings, if any, as abbreviated stripes

.....26



26. a. A yellowish or grayish stripe laterally on thorax above wing base; abdomen usually with three dull yellow stripes which are often much reduced, especially the lateral ones
 *obsoletus obsoletus* Wiedemann
 b. No stripe on thorax above wing base

.....27



27. a. Hind legs predominantly dark; rarely with any trace of abdominal pattern; apical spot usually not extending beyond second submarginal cell (smc2)

.....*parvulus* Daecke



- b. Hind legs predominantly yellow or brownish; abdomen usually with distinct traces of pale median line and occasionally with traces of lateral lines; apical spot usually extends into the first posterior cell

.....*dacne* Philip

- 28.(22)a. Abdomen with 4 more or less complete dark longitudinal stripes
 29

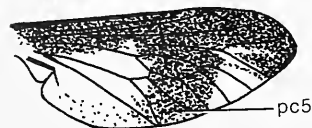
- b. Abdomen not striped or with less than 4 stripes

.....31



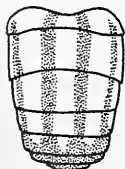
29. a. Fifth posterior cell (pc5) almost entirely infuscated; scutellum yellow

.....*vittatus* Wiedemann



- b. Fifth posterior cell almost entirely hyaline; scutellum dark, with or without paler apex and/or sides

.....30



30. a. Apical spot nearly fills second submarginal cell (smc2); 2 central stripes of abdomen rarely joined on second segment; frontal callus usually yellow, sometimes brown or black

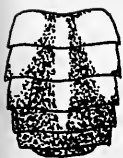
.....*aberrans* Philip



- b. Apical spot only about half fills second sub-marginal cell; 2 central abdominal stripes usually join on second segment; frontal callus usually black, sometimes brownish, rarely yellowish

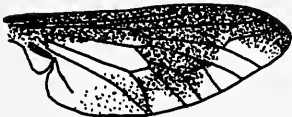
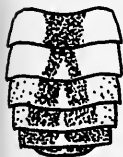
.....*striatus* Osten Sacken





- 31.(28)a. Apical spot fills out most of second sub-marginal cell and extends into first and sometimes second posterior cell, usually connecting with crossband by an infuscated streak in first posterior cell (pcl); abdomen with 2 stripes which are sometimes reduced to faint lines or enlarged to cover most of abdomen on each side of a yellow stripe; scutellum usually with considerable yellow

.....*macquarti* Philip



- b. Apical spot fills only about half of second submarginal cell and does not extend further; abdomen not striped; scutellum dark

.....*indus* Osten Sacken



- 32.(17)a. Apical spot narrow including at most only extreme apex of second submarginal cell (smc2)

..... 33



- b. Apical spot broad, entering second submarginal cell over at least one-third of upper branch of third longitudinal vein (lv3)

..... 36



33. a. Apical spot beyond where it leaves crossband slightly wider than marginal cell (mc); frontal callus usually yellow, often bordered with black or brown, occasionally black (see illustration for couplet 23)

..... 34



- b. Apical spot at base narrower or just as wide as marginal cell; frontal callus black

..... 35



34. a. Black spot on second abdominal segment practically joins with that on first segment; second and third sternites with black sublateral spots; robust species

.....*sackeni* Hine



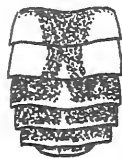
- b. Black spot on second segment usually does not attain anterior margin of the segment; no sublateral spots on sternites; more slender species

.....*pudicus* (in part) Osten Sacken



35. a. Crossband dilute and leaving about half of the discal cell (dc) hyaline; cheeks black; frontoclypeus (fc) with a large black spot on each side

.....*delicatus* Osten Sacken



- b. Crossband saturate and covering discal cell; frontoclypeus and cheeks yellow or orange

.....*callidus* Osten Sacken

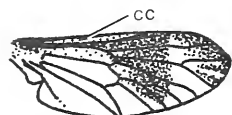


- 36.(32)a. Blackish species with a mid-dorsal yellow (occasionally grayish) abdominal stripe and often with shorter sublateral stripes

.....37

- b. Abdomen with a different pattern and showing more yellow

.....38



37. a. Infuscation of costal cell (cc) distinctly paler than crossband; apical spot often nearly filling second submarginal cell (smc2)

.....*upsilon* Philip



- b. Costal cell same color as crossband; apical spot variable but rarely filling as much as half of second submarginal cell

.....*univittatus* Macquart



38. a. Hyaline triangle distinctly crosses second longitudinal vein (lv2), nearly separating apical spot from crossband

.....39



- b. Hyaline triangle at most reaches second longitudinal vein

.....41

b



39. a. Apical spot occupies only about half of second submarginal cell; crossband usually does not reach hind margin of wing

.....*lateralis* Wiedemann



- b. Apical spot occupies almost all of second submarginal cell; crossband reaches hind margin of wing

.....40



40. a. Second abdominal segment with a black inverted "V" or a pair of oblique spots

.....*geminatus* Wiedemann





b. Second abdominal segment entirely yellow

.....*impunctus* Kroeber



41.(38)a. Abdomen with 4 rows of spots, but lateral spots on second segment may be reduced or absent; median figure on second segment an inverted "V"; scutellum and frontal callus normally dark but the latter sometimes brownish

.....*montanus* Osten Sacken

b. Abdomen normally not with 4 rows of spots

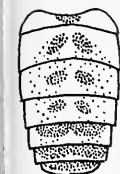
..... 42

42. a. Hyaline triangle reaches second longitudinal vein

..... 43

b. Hyaline triangle does not reach second longitudinal vein (see illustration for couplet 38b)

..... 44



43.

a. Crossband dilute and basal portion of discal cell (dc) pale or hyaline; frontal callus and hind femora yellow; usually no dark spot under scutellum

.....*cursim* Whitney



b. Crossband not very dilute and basal portion of discal cell usually concolorous with rest of crossband; frontal callus yellow or fuscous and hind femora usually dark at base; there is a dark spot under scutellum (see illustration for couplet 34b)

.....*pudicus* (in part) Osten Sacken



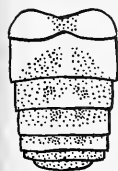
44.

a. Abdominal markings black, median marking of second segment usually reaches anterior margin; frontal callus normally black but sometimes yellow; usually at least basal portion of hind femora black

.....*dinmocki* Hine

b. Abdominal markings pale to dark brown, sometimes evanescent; median marking of second abdominal segment rarely attains anterior margin; frontal callus yellow; hind femora yellow to brown

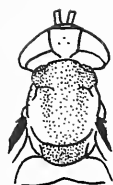
..... 45



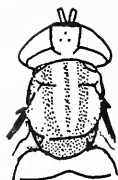
45.

a. Thorax greenish gray with fuscous stripes; outer margin of crossband usually sinuous

.....*celatus* Pechuman

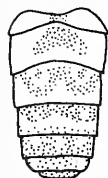


a



b

- b. Thorax brown to yellowish in ground color with brown stripes;
outer margin of crossband concave, straight, bowed, or sinuous
..... 46



46.

- a. Dark median marking of second abdominal segment reaching
about two-thirds across segment; outer margin of crossband
usually straight or somewhat concave; hind femora yellow
..... *flavidus* Wiedemann



47.

- b. Dark median marking of second abdominal segment reaching
only about half-way across segment; outer margin of crossband
frequently bowed or sinuous; hind femora partly or all brown
..... 47
- a. Apical spot occupying upper half or second submarginal
cell(smc2) and sharply outlined; fifth posterior cell (pc5) largely
hyaline; smaller species averaging 8.25mm

..... *dixianus* Pechuman



- b. Apical spot indefinite in outline, extending into lower half of
second submarginal cell as a paler infuscation which may
continue into apical portions of first, second and third posterior
cells; fifth posterior cell largely infuscated; larger species
averaging 9.5mm

..... *reicherti* Fairchild



II. MALES

(*C. bistellatus* and *C. dixianus* not included)

1. a. Apex of wing beyond crossband hyaline 2
 - b. Apex of wing infuscated beyond crossband so that an apical spot is present 12
2. a. Frontoclypeus black with a midfacial pollinose stripe which begins below antennae and runs at least half way to the oral margin 3
 - b. Frontoclypeus black or yellow without a midfacial pollinose stripe 10
3. a. Abdomen completely black 4
 - b. First 2 abdominal segments with small reddish or yellowish spots laterally 8
4. a. Fifth posterior cell with hyaline area at base 5
 - b. Fifth posterior cell infuscated at base 6
5. a. Outer margin of crossband straight or slightly and evenly bowed; crossband usually reaching hind margin of wing in fourth and fifth posterior cells in full intensity; hyaline area at base of fifth posterior cell large and sharply defined *carbonarius* Walker
 - b. Outer margin of crossband not usually reaching wing margin in full intensity; hyaline area at base of fifth posterior cell usually not with clearly defined margin; apical area of wing sometimes dilutely infuscated *ater* Macquart
6. a. Crossband broadly and distinctly reaching hind margin of wing; outer margin of crossband usually straight *cincticornis* Walker
 - b. Crossband reaching hind margin of wing narrowly and indistinctly or not at all; outer margin of crossband usually irregular 7
7. a. Beard with many yellow hairs; yellow hairs frequently mixed with black hairs of thorax, legs, and abdomen; sometimes with traces of pale abdominal markings *exitans* Walker
 - b. Beard wholly black; rarely with pale hairs on body or with traces of pale abdominal markings *mitis* Osten Sacken
- 8.(3) a. Wing pattern saturate; lateral spots on first 3 abdominal segments barely indicated *exitans* Walker
 - b. Wing pattern dilute; lateral spots on first 2 abdominal segments distinct 9

9. a. Yellow spots on mid-dorsal line of abdomen; both basal cells nearly clear; pleurae with 2 pale stripes
.....*fulvistigma* Hine
- b. No mid-dorsal yellow spots on abdomen; both basal cells $\frac{3}{4}$ infuscated; pleurae unstriped
.....*cuclux* Whitney
- 10.(2) a. Wing markings faint; face often entirely black
.....*nigribimbo* Whitney
- b. Wing markings dark; frontoclypeus yellow in middle
..... 11
11. a. Thoracic stripes faintly distinct; rarely a spot at bifurcation of third longitudinal vein
.....*calvus* Pechuman & Teskey
- b. Thoracic stripes obsolete; often a spot at bifurcation of third longitudinal vein
.....*niger* Macquart
- 12.(1) a. Frontoclypeus with a midfacial pollinose stripe which begins below antennae and runs at least half way to oral margin
..... 13
- b. Frontoclypeus without midfacial stripe, integument of face at least partly yellow
..... 15
13. a. Abdomen without longitudinal stripes; usually with considerable yellow on abdomen; legs usually with much yellow; frontoclypeus usually black, sometimes partially or completely yellow
.....*frigidus* Osten Sacken
- b. Abdomen with black or yellow longitudinal stripes
..... 14
14. a. Abdomen yellowish with mid-dorsal black stripe
.....*dorsovittatus* Hine
- b. Abdomen black with a narrow yellowish mid-dorsal line and occasionally similar shorter sublateral lines
.....*upsilon* Philip
- 15.(12)a. Abdomen black with no yellow markings; hind femora black
..... 16
- b. Abdomen with yellow markings; hind femora variable
..... 18
16. a. Apical spot not covering all of second submarginal cell
.....*brimleyi* Hine
- b. Apical spot includes all of second submarginal cell
..... 17
17. a. Hyaline triangle clear, restricted to apices of second and third posterior cells; thorax usually with at least a trace of a pale stripe above wing base; facial area with considerable yellow
.....*moechus* Osten Sacken
- b. Hyaline triangle dilutely infuscated; no trace of a pale stripe above wing base; yellow of facial area restricted to a narrow stripe in center of frontoclypeus; pleurae with some pale markings; first 2 antennal segments, fore coxae and femora with considerable yellow
.....*parvulus* Daecke

- 18.(15)a. Crossband and apical spot broken by dilute areas along veins
 *shermani* Hine
- b. Crossband and apical spot not broken by dilute areas although entire wing may be pale
 19
19. a. Wing pattern dilute and indefinite; hyaline triangle indicated by clear area along edge of crossband and not usually extending beyond center of third posterior cell; first antennal segment considerably swollen; brown species with no definite abdominal pattern although dark markings may be indicated by dark shadows
 *brunnes* Hine
- b. Wing pattern distinct; hyaline triangle open at hind margin of wing (except probably in *bistellatus* the male of which is undescribed); first antennal segment not especially swollen, often very slender
 20
20. a. Black species; abdomen with a yellowish median longitudinal stripe, occasional specimens vary with a similar abbreviated stripe on each side; hyaline triangle crosses second longitudinal vein; apical spot rarely occupies more than half of second submarginal cell, often less
 *univittatus* Macquart
- b. Not with above combination of characters
 21
21. a. Apical spot very little broader at its apex than at its origin, crossing upper branch of third longitudinal vein at its apex and occupying very little of the second submarginal cell
 22
- b. Apical spot considerably broadened towards its apex, crossing at least half of upper branch of third longitudinal vein
 24
22. a. Hyaline triangle not reaching second longitudinal vein
 *sackeni* Hine
- b. Hyaline triangle reaching or crossing second longitudinal vein
 23
23. a. Frontoclypeus with a large black spot on each side
 *delicatulus* Osten Sacken
- b. Frontoclypeus entirely yellow or, at most, with some dark shading around frontoclypeal pits
 *callidus* Osten Sacken
- 24.(21)a. Abdomen bright yellow and black; large black figure of second abdominal segment broadly joined to black figure of first segment; median yellow triangles do not reach the anterior border of the segments; apical spot occupying one-half to two-thirds of second submarginal cell
 25
- b. Not with above combination of characters
 26
25. a. Abdomen with a sublateral row of black spots; median yellow triangles moderate in size; hyaline triangle extending beyond bifurcation, sometimes reaching second longitudinal vein
 *montanus* Osten Sacken

- b. Abdomen without a sublateral row of black spots; hyaline triangle ends at bifurcation
.....*indus* Osten Sacken
26. a. Apical spot filling about half or less of second submarginal cell
.....27
b. Apical spot filling all or nearly all of second submarginal cell, sometimes extending into first posterior cell
.....33
27. a. Frontoclypeus with a black spot on each side; hyaline triangle crosses second longitudinal vein
.....*lateralis* Wiedemann
b. Frontoclypeus entirely yellow; hyaline triangle does not cross second longitudinal vein
.....28
28. a. First basal cell infuscated, except for subhyaline area near apex; second basal cell at least half infuscated; hind femora usually partly black
.....*dimmocki* Hine
b. First basal cell usually not more than half and second basal cell one-third infuscated; hind femora often entirely yellow; dark markings on second abdominal segment not reaching the anterior margin
.....29
29. a. Thorax yellow or brownish in ground color with brown stripes
.....30
b. Thorax greenish gray with fuscous stripes
.....31
30. a. Outer margin of crossband nearly straight; ground color of abdomen rather uniformly yellow; legs yellow
.....*flavidus* Wiedemann
b. Outer margin of crossband sinuous; base of second abdominal segment often with a greenish cast; legs pale mahogany
.....*reicherti* Fairchild
31. a. Crossband dilute, base of discal cell nearly hyaline; ground color of abdomen bright yellow; hind femora entirely yellow
.....*cursim* Whitney
b. Crossband saturate or nearly so, discal cell not paler at base; ground color of abdomen dull yellow; hind femora variable
.....32
32. a. Hind femora usually dark at base; a black spot beneath scutellum; dark abdominal markings usually saturate
.....*pudicus* Osten Sacken
b. Hind femora usually entirely yellow; black spot beneath scutellum very pale or absent; dark abdominal markings often faded
.....*celatus* Pechuman
- 33.(26)a. Hyaline triangle crosses second longitudinal vein; yellow species with black abdominal markings not in the form of stripes
.....34
b. Not with above combination of characters
.....35

34. a. Second abdominal segment with 2 oblique spots which frequently are joined to form a single inverted "V"
.....*geminatus geminatus* Wiedemann
b. Second abdominal segment completely yellow or with traces of 2 spots at posterior margin
.....*impunctus* Krober
35. a. Hyaline triangle reaches or nearly reaches second longitudinal vein if subhyaline beyond bifurcation of third longitudinal vein; predominantly black species with pale abdominal markings reduced
.....38
b. Hyaline triangle scarcely extends beyond bifurcation of third longitudinal vein; predominantly yellowish species with dark abdominal markings
.....36
36. a. Abdomen with a median yellow stripe with a longitudinal black band on each side; lateral margins of segments narrowly yellow
.....*macquarti* Philip
b. Abdomen yellow with 4 more or less complete rows of black spots
.....37
37. a. Ground color of thorax and scutellum yellow
.....*vittatus vittatus* Wiedemann
b. Ground color of thorax plumbeus, scutellum sometimes with some yellow
.....*aberrans* Philip
38. a. Blackish species, with reduced pale abdominal markings
.....39
b. Yellow species with black abdominal markings
.....40
39. a. Thorax without a yellow stripe above wing base; lower border of second basal cell not more heavily infuscated than adjoining portion of cell
.....*dacne* Philip
b. Thorax with a yellow stripe on each side above wing base; lower border of second basal cell infuscated; abdomen with a dull yellowish median stripe, frequently with a shorter stripe on each side
.....*obsoletus obsoletus* Wiedemann
40. a. Frontoclypeus with a large dark spot on each side and cheeks with considerable black
.....41
b. Frontoclypeus and cheeks mostly yellow
.....42
41. a. No sublateral spots on first and second tergites; second basal cell not more than half infuscated sometimes almost entirely clear; hyaline triangle rounded at apex
.....*pikiei* Whitney
b. Sublateral stripes completely cross first two tergites; second basal cell largely infuscated with a subhyaline area near apex; hyaline triangle pointed at apex
.....*sequax* Williston

42. a. Second basal cell hyaline; thoracic stripes distinct, yellowish
 *beameri* Brennan
 b. Second basal cell largely infuscated; thoracic stripes indistinct,
 greenish
 *hinei* Daecke

Chrysops aberrans Philip

This species may be found in the Northern and Eastern Panhandles of the state.

Chrysops ater Macquart

Seasonal Range—14-V to 3-VI.

Distribution—POCAHONTAS, Cranberry Glades, 1,2-VI-55, HW, USNM. PRESTON, Cranesville Swamp, 3-VI-76, BD, WVU. RANDOLPH, Sinks of Gandy, 1-VI-77, JA, WVU. TUCKER, Blackwater Falls St. Pk., 21-V-77, JA, WVU.

C. ater is a northern species, previously unknown south of ROCKBRIDGE, VA, SOMERSET, PA, AND JEFFERSON, OH. In West Virginia this species is common locally in isolated mountain bogs and seems to be restricted to these habitats.

Chrysops beameri Brennan

Seasonal Range—7-VII (VII to 25-VIII).

Distribution—MASON, McClintic Wildlife Sta., 7-VII-77, JH, WVDA.

Specimens collected in West Virginia are not typical of the species; thus their true identity is in question. However, the species has been taken in all of the contiguous states except KY and should occur throughout West Virginia.

Chrysops bistellatus Daecke

This is primarily a coastal species but may occur in the Eastern Panhandle of West Virginia.

Chrysops brimleyi Hine

Most records of this species are from coastal areas; the species may occur in the state's Eastern Panhandle.

Chrysops brunneus Hine

Reported catches from OH, PA, MD, and VA suggest occurrence of this species in West Virginia.

Chrysops callidus Osten Sacken

Seasonal Range—17-V to 3-VIII (6-V to 6-IX).

Distribution—BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 2-VIII-75, BD, WVU. BRAXTON, Sutton Lake, 3-VI-77, LB, WVU. BROOKE, Castleman Run Lake, 9-VI-76, BD, WVU. CABELL, Barboursville, 1-VI-78, JH, WVDA. FAYETTE, Rainelle, 29-VII-77, TK, WVU. GILMER, Cedar Ck. St. Pk., 4-VI-77, LB, WVU. GRANT, Greenland Gap, 24-V-77, JA and LB, WVU. GREENBRIER, Clendinsville, 18-VI-76, JH, WVDA. HAMPSHIRE, Capon Bridge, 24-VI-75, CC, WVDA. HANCOCK, Tomlinson Run St. Pk., 9-VI-76, LB and BD, WVU. HARDY, Lost River St. Pk., 19-VI-51, KVK, KVK. HARRISON, Hepzibah, 17-VI-76, TM, WVU. JACKSON, Ripley, 2-VI-75, JH, WVDA. JEFFERSON, Shannondale, 1-VI-77, JH, WVDA. KANAWHA, Kimberly Rd., 17-VI-76,

SF, WVDA. LEWIS, Jackson's Mill, 28-VII-75, JH, WVDA. LINCOLN, Big Ugly Publ. Hunt. Area, 2-VIII-78, LB, WVU. MARSHALL, Burches Run Lk., 25-V-77, JH, WVDA. MASON, Point Pleasant, 5-VI-75, JH, WVDA. MINERAL, New Creek, 11-VI-76, BD, WVU. MONONGALIA, Dent's Run, 17-V-75, BD, WVU. OHIO, Bear Rocks Lk., 25-V-77, JH, WVDA. PENDLETON, Brandywine Lk., 22-VII-77, LB, WVU. PLEASANTS, Bens Run, 25-V-77, JH, WVDA. PRESTON, Reedsville, 24-VII-75, BD, WVU. RANDOLPH, Gilman, 10-VI-76, PV, WVDA. RITCHIE, 26-V-76, TM, WVU. ROANE, 2 mi. W. Spencer, 22-V-78, LB, WVU. SUMMERS, Bluestone Lk., 2-VI-77, JA, WVU. TYLER, Pursley, 25-V-77, JH, WVDA. UPSHUR, Buckhannon, 12-VI-76, JH, WVDA. WETZEL, Lewis Wetzel Publ. Hunt. Area, 18-VI-76, BD and LB, WVU. WOOD, Parkersburg, 28-V-76, TM, WVU.

This is one of the more abundant and pestiferous *Chrysops* in West Virginia. The importance of this species is increased because of its long seasonal occurrence; it remains abundant after the decline of the early season species complex (*C. calvus*, *carbonarius*, *cincticornis*, *cuchux*, *indus* and *niger*). The numbers of *C. callidus* remain high throughout the mid-June surge of other tabanid species (*C. geminatus*, *impunctus*, *lateralis*, *macquarti*, *univittatus*, *vittatus* and various *Tabanus* sp.), but decline rapidly in late June and early July.

On 14 June 1976, an area near Core in Monongalia County was surveyed at the request of the property owner who experienced acute sensitivity to deerflies, becoming drowsy and languid after receiving two or three bites. A three-day survey of the area, using sweep net sampling and CO₂ baited malaise traps, revealed *C. callidus* as the only *Chrysops* present. Local control of tabanids in this case would have been highly desirable.

Chrysops calvus Pechuman and Teskey

Seasonal Range—20-V to 25-VI (1-V).

Distribution—CALHOUN, Rt. 33, 2 mi. E. county line, 27-V-78, LB, WVU. MARSHALL, Burches Run Lk., 25-V-77, JH, WVDA. MINERAL, New Creek, 11-VI-76, BD, WVU. MONONGALIA, 31-V-75, LB, WVU. POCAHONTAS, Cranberry Glades, 21-VI-75, BD, WVU (Allen and Pechuman, 1977). PRESTON, Bruceton Mills, 1-VI-65, WJ, CU, Paratype (Pechuman and Teskey, 1967). RANDOLPH, Rt. 219, 5 mi. N. Elkins, 5-VI-76, BD, WVU. ROANE, 31-V-58, RW, OSU, Paratype (Pechuman and Teskey, 1967). SUMMERS, Pipestem St. Pk., 9, 10-VI-76, JH, WVDA. TUCKER, Rt. 217, W. Slope Backbone Mt., 14-V-76, BD, WVU. WEBSTER, Cranberry

Campground, 20-VI-75, BD, WVU. WYOMING, Pineville, 20-V-77, LB, WVU.

This species is generally distributed but not very abundant. It has often been collected with its close relative, *C. niger*, although it occurs in locations where *C. niger* was not taken. The specimens from PRESTON and ROANE were designated paratypes by Pechuman and Teskey (1967).

Chrysops carbonarius Walker

Seasonal Range—28-V to 1-VIII (2-V).

Distribution—BERKELEY, Sleepy Ck. Publ. Hunt. and Fish. Area, 28-V-76, BD, WVU. GREENBRIER, S. Fork Cherry River, 11-VII-76, BD, WVU. JEFFERSON, Shannondale, 1-VI-77, JH, WVDA. PENDLETON, Seneca Campground, 11-VII-76, BD, WVU. POCAHONTAS, Deer Ck./Rt. 28, 1-VI-77, JA, WVU. PRESTON, Eglon, 28-V-75, RW¹, WVU. RANDOLPH, Sinks of Gandy, 1-VI-77, JA, WVU. SUMMERS, Pipestem St. Pk., 9-VI-76, JH, WVDA. TUCKER, Dolly Sods, 3-VII-75, LB AND DB, WVU. WEBSTER, Cranberry Campground, 20-VI-75, BD, WVU.

This species occurs primarily in the Eastern Panhandle and central mountainous areas. It is usually important in the spring as a part of an emerging wave or complex of species (see *C. callidus* discussion). Only in WEBSTER did this species make up as much as 45 percent of the *Chrysops* collected.

Chrysops celatus Pechuman

Seasonal Range—2-VI (26-V to 8-VII).

Distribution—SUMMERS, Bluestone Lk., 2-VI-77, JA, WVU.

Scattered records for this species were reported from NY to AL. Despite this wide distribution, these deerflies seem very local in occurrence.

Chrysops cincticornis Walker

Seasonal Range—23-IV to 3-VIII (20-IV).

Distribution—BARBOUR, Pleasant Ck., 23-IV-77, JA, WVU. BERKELEY, Sleepy Ck. Publ. Hunt. and Fish. Area, 3-VIII-75, BD, WVU. BROOKE, Castleman Run Lk., 9-VI-76, BD, WVU. GRANT, Sherr, 24-V-77, LB, WVU. HAMPSHIRE, Grace, 20-VI-78, WVDA. HANCOCK, Tomlinson Run St. Pk., 9-VI-76, BD, WVU. JEFFERSON, Shannondale, 1-VI-77, JH, WVDA. MASON, McClintic Wildlife Sta., 6-VI-78, JH, WVDA. MINERAL, New Creek, 11-VI-76, BD, WVU. MONONGALIA, Morgantown, 28-V-74, GP, ND. McDOWELL, Panther St. For., 21-V-77, LB, WVU. OHIO, Bear Rock Lk., 25-V-77, JH, WVDA. POCAHONTAS, Cranberry Glades, 21-VII-75, SB, VPI (Allen and Pechuman, 1977). PRESTON, Muddy Creek, 1-VII-75, BD, WVU. SUMMERS, Pipestem St. Pk., 9, 10-VI-76, JH, WVDA. WEBSTER, Cranberry Campground, 11-VII-76, BD, WVU. WOOD, Waverly, 25-V-77, JH, WVDA.

This species is not abundant and ranks close to *C.*

carbonarius in numbers collected. However, *C. cincticornis* is more evenly distributed throughout the state and forms part of the spring complex of deerflies.

Chrysops cuclux Whitney

Seasonal Range—20-V to 21-VI (8-V to 22-VII).

Distribution—BERKELEY, Sleepy Ck. Publ. Hunt. and Fish. Area, 28-V-76, BD, WVU. BROOKE, Castleman Run Lk., 9-VI-76, BD and LB, WVU. HANCOCK, Tomlinson Run St. Pk., 9-VI-76, LB, WVU. MASON, McClintic Wildlife Sta., 21-V-76, BD, WVU. MONONGALIA, Joe's Run, 20-V-77, JA, WVU. PRESTON, Cranesville Swamp, 3-VI-76, BD, WVU. POCAHONTAS, Cranberry Glades, 21-VI-77, SB, VPI (Allen and Pechuman, 1977). RANDOLPH, Rt. 219, 5 mi. N. Elkins, 5-VI-76, BD, WVU. TUCKER, Dolly Sods, 10-VI-77, JA, WVU.

Records show a general distribution at lower elevations; only in the higher elevations were series taken indicating a greater abundance of this species in these areas.

Chrysops cursim Whitney

This is not a common species, and of the surrounding states it is found only in PA and MD. However, it is found scattered throughout eastern North America and thus may occur in West Virginia.

Chrysops dacne Philip

This species has been captured in PA, MD, and VA counties near the West Virginia borders, indicating that it probably occurs in West Virginia also.

Chrysops delicatulus Osten Sacken

PORTAGE, OH, and PRINCE GEORGES, MD, are the only two records from the surrounding states; the species is more common northward.

Chrysops dimmocki Hine

This species probably occurs in West Virginia as it has been captured in all states contiguous to West Virginia, except KY.

Chrysops dixonianus Pechuman

VA records mark the northernmost known range for this newly described species. No specimens have been taken in West Virginia.

Chrysops dorsovittatus Hine

This species is uncommon, and only two county records are known from the surrounding states: MD and VA.

Chrysops exitans Walker

Seasonal Range—3-VII (27-V to late VII).

Distribution—TUCKER, Dolly Sods, 3-VII-75, LB and DB, WVU (male).

The capture of this specimen marks a new southern range extension for this species. It had previously been found as far south as MONROE, PA, and OCEAN, NJ. Pechuman agrees that its occurrence in West Virginia represents a disjunct population. More collecting in the areas between the capture localities should confirm this opinion.

Chrysops flavidus Wiedemann

Seasonal Range—26-VI to 2-VIII (9-VI to 20-VIII).
Distribution—BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 2-VIII-75, BD, WVU. KANAWHA, Kanawha Station, 26-VI-78, SR, USNM. LEWIS, Jackson's Mill, 26-VII-77, JH, WVDA. MASON, McClintic Wildlife Sta., 2-VIII-78, Butler, WVU. TUCKER, 28-VIII-77, BN, WVU.

Though not a common species, *C. flavidus* is found scattered through all of the surrounding states and is reportedly more abundant near the Atlantic coast.

Chrysops frigidus Osten Sacken

This is a northern species with present southernmost records from PORTAGE, OH, and CENTRE, PA, both near but still north of West Virginia's northern borders.

Chrysops fulvistigma Hine

This is primarily a southern species, approaching its northern limits in MD and NJ. It is not commonly collected anywhere in its known range but may occur in West Virginia.

Chrysops geminatus Wiedemann

Seasonal Range—25-VI to 9-VIII (26-V to 19-VIII).
Distribution—BRAXTON, Sutton Lk., VIII-7-75, BD, WVU. BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 23-VII-76, BD, WVU. GREENBRIER, S. Fk. Cherry River, II-VII-76, LB & BD, WVU. HAMPSHIRE, Capon Bridge, 16-VII-77, PV, WVDA. JEFFERSON, Shannondale, 27-VII-78, CC, WVDA. MINERAL, New Creek, 25-VI-76, BD, WVU. MONONGALIA, I-VII-75, BD, WVU. MORGAN, Cherry Run, 5-VII-78, CC, WVDA. PENDLETON, Spruce Knob, 6-VIII-60, GW, CM. POCAHONTAS, Cranberry Glades, 16-VII-55, CWS, USNM. PRESTON, Chestnut Ridge, I-VII-75, BD, WVU. RANDOLPH, Rt. 250 near Cheat Mt., 6-VIII-60, HM and GW, CM. SUMMERS, Pipestem St. Pk., 28-VII-76, TM, WVU. WEBSTER, Bergoo, 13-VII-78, JH, WVDA. WETZEL, Lewis Wetzel Publ. Hunt. Area, 3-VII-78, LB, WVU.

C. geminatus was expected to occur in West Virginia prior to this study because of records from contiguous states. No specimens have been taken from the western geographical zones of West Virginia.

Chrysops hinei Daecke

This species is uncommon in the neighboring states, but it has been taken in MD and VA.

Chrysops impunctus Krober

Seasonal Range—25-VI to 15-VII (17-VII).
Distribution—BRAXTON, Sutton Lk., 8-VII-75, BD, WVU. MINERAL, New Creek, 25-VI-76, BD, WVU. MONONGALIA, Chestnut Ridge, 15-VII-77, JA, WVU. McDOWELL, Panther St. For., 10-VII-77, LB, WVU. POCAHONTAS, "July," CS, WVU. PRESTON, Brandonville Pike, I-VII-75, BD, WVU. WEBSTER, Bergoo, 13-VII-78, JH, WVDA.

This species is often caught along with *C. geminatus*

but is less abundant, having a more spotty distribution. Until recently this species has been treated as a subspecies of *C. geminatus*. However, the characters are so constant that it is treated here as a separate species.

Chrysops indus Osten Sacken

Seasonal Range—12-V to 8-VIII (1-V)
Distribution—BARBOUR, Pleasant Ck., 12-V-77, LB, WVU. BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 28-V-76, BD, WVU. BROOKE, Castleman Run Lk., 9-VI-76, BD, WVU. HANCOCK, Tomlinson Run St. Pk., 9-VI-76, BD, WVU. GRANT, Sherr, 12-V-77, LB, WVU. HARDY, Warden Lk., 24-VII-76, BD, WVU. MARSHALL, Burches Run Lk., 21-VI-76, SB, VPI (Allen and Pechuman, 1977). MINERAL, New Creek, II-VI-76, BD, WVU. MONONGALIA, Dent's Run, 22-V-75, DB, WVU. OHIO, Bear Rocks Lk., 25-V-77, JH, WVDA. POCAHONTAS, Cranberry Glades, I-VI-55, HW, USNM. PRESTON, Reedsville, 17-VI-75, LB, WVU. RANDOLPH, Sinks of Gandy, I-VI-77, JA, WVU. SUMMERS, Pipestem St. Pk., 10-VI-76, JH, WVDA. TUCKER, Fisher Run, 7-VII-61, PH, USNM.

Records from West Virginia and MD mark the southernmost range of this species, although disjunct populations may occur in VA and NC. It is most abundant in the spring, but will readily attack man during the remainder of the season when it is less abundant.

Chrysops lateralis Wiedemann

Seasonal Range—25-VI to 9-VIII (7-VI).
Distribution—GREENBRIER, S. Fk. Cherry River, II-VII-76, BD, WVU. MINERAL, New Creek, 25-VI-76, BD, WVU. PENDLETON, Spruce Knob 5,6,7-VIII-60, GW, CM. POCAHONTAS, Hillscreek Falls, 12-VII-76, BD, WVU. PRESTON, Brandonville Pike, I-VII-75, BD, WVU. RANDOLPH, Rt. 250 near Cheat Mt., 6-VIII-60, HM and GW, CM. TUCKER, Dolly Sods, 3-VII-75, LB and DB, WVU.

A series of ten females taken in GREENBRIER represents the southernmost distribution and a range extension for this species. Typical of northern species in West Virginia, *C. lateralis* is restricted to the mountainous areas of the state, being a common pestiferous species.

Chrysops macquarti Philip (Synonym prior to 1961 *C. univittatus* of authors but not Macquart)

Seasonal Range—25-V to 18-VIII (11-V to 1-IX).
Distribution—BRAXTON, Sutton Lk., 3-VI-77, LB, WVU. BROOKE, Castleman Run Lk., 9-VI-76, BD, WVU. FAYETTE, 30-VI-76, BD, WVU. HAMPSHIRE, 2 mi. E. Capon Bridge, 3-VII-75, BD, WVU. HARDY, Warden Lk., 24-VII-76, LB, WVU. JEFFERSON, Shannondale, 28-VI-78, CC, WVDA. MARION, Mannington, 6-VII-76, TM, WVU.

MASON, McClintic Wildlife Sta., 7-VII-77, JH, WVDA. MERCER, Athens, 29-VI-76, BD, WVU. MINERAL, New Creek, 11-VI-76, BD, WVU. MINGO, Williamson, 19-VII-76, BD, WVU. MONONGALIA, 28-VI-75, LB, WVU. OHIO, Bear Rocks Lk., 25-V-77, JH, WVDA. PENDLETON, Ft. Seybert, 15-VII-76, WN and KE, WVDA. POCAHONTAS, Cranberry Glades, 20-VI-75, BD, WVU. PRESTON, Brandonville Pike, 1-VII-75, BD, WVU. RANDOLPH, Laurel Fk. Campground, 9-VIII-75, BD, WVU. SUMMERS, Pipestem Lk., 28-VI-76, JH, WVDA. TAYLOR, 25-VI-76, TM, WVU. WEBSTER, Cranberry Campground, 20-VI-75, BD, WVU. WETZEL, Lewis Wetzel Publ. Hunt. Area, 18-VI-76, BD, WVU.

This species is a successful biter because of its silent approach. Fifty percent of the records occur in July, and it has a general distribution throughout West Virginia and the surrounding states.

Chrysops mitis Osten Sacken

This is a northern species not known south of NY except by a few unconfirmed reports. Disjunct colonies may occur in West Virginia.

Chrysops moechus Osten Sacken

Seasonal Range—21-V to 15-VIII.

Distribution—BOONE, Fork Cr. Publ. Hunt. Area, 14-VI-78, LB, WVU. BROOKE, Castleman Run Lk., 9-VI-76, BD, WVU (male). GILMER, Cedar Ck. St. Pk., 4-VI-77, LB, WVU. HAMPSHIRE, Capon Bridge, 16-VII-75, PV, WVDA. HARDY-HAMPSHIRE, Potomac River, 10-VII-76, DB, WVU. HARRISON, Near Salem along Ten Mile Ck., 21-VI-76, DB, WVU. LEWIS, Jackson's Mill, 27-VII-77, JH, WVDA. LINCOLN, Big Ugly Publ. Hunt. Area, 2-VIII-78, LB, WVU. MINERAL, Burlington, 15-VI-36, GK, CM. PRESTON, Clifton Mills, 24-VI-77, JA, WVU. RITCHIE, North Bend St. Pk., 23-VI-77, LB, WVU. WAYNE, Cabwaylingo St. For., 21-V-77, LB, WVU.

This species may become locally abundant, especially near streams with overhanging vegetation. The adults are especially sexually dimorphic.

Chrysops montanus Osten Sacken

Seasonal Range—9-VI-76 (27-V to 11-VIII).

Distribution—HANCOCK, Tomlinson Run St. Pk., 9-VI-76, BD, WVU.

This species occurs commonly in NY but may be quite local there and elsewhere. It has been taken in MD, DC, VA, PA, and OH.

Chrysops niger Macquart

Seasonal Range—12-V to 20-IX.

Distribution—BARBOUR, Pleasant Ck., 12-V-77, LB, WVU. BERKELEY, Inwood, 1-VI-77, JH, WVDA. BROOKE, Castleman Run Lk., 9-VI-76, LB, WVU. GILMER, Stumptown, 27-V-78, LB, WVU. GRANT, Scherr, 24-V-77, LB, WVU. HAMPSHIRE-

HARDY, Potomac River, 21-VI-76, DB, WVU. HANCOCK, Tomlinson Run St. Pk., 9-VI-76, LB, WVU. JEFFERSON, Charles Town, 1-VI-77, JH, WVDA. MASON, Point Pleasant, 5-VII-75, JH, WVDA. MINERAL, New Creek, 11-VI-76, BD, WVU. MONONGALIA, Morgantown, 28-V-74, GP, ND. MORGAN, Cherry Run, 27-VI-78, CC, WVDA. OHIO, Bear Rocks Lake, 25-V-77, JH, WVDA. PENDLETON, Seneca Campground, 23-VI-76, BD, WVU. PLEASANTS, Bens Run, 25-V-77, JH, WVU. POCAHONTAS, Cranberry Glades, 21-VI-75, BD, WVU. PRESTON, Reedsville Exp. Sta., 9-VI-75, LB, WVU. RANDOLPH, Rt. 219, 5 mi. N. Elkins, 5-VI-76, BD, WVU. RITCHIE, Lynn Camp Rd. near Pennsboro, 26-V-76, TM, WVU. SUMMERS, Pipestem St. Pk., 9-VI-76, JH, WVDA. TYLER, Pursley, 25-V-77, JH, WVDA. WAYNE, Fort Gay, 2-VII-71, RT, WVU. WEBSTER, Cranberry Campground, 20-VI-75, BD, WVU. WETZEL, Lewis Wetzel Publ. Hunt. Area, 18-VI-76, BD, WVU. WIRT, VI-56, HP, WVU. WOOD, Rockport, 11-VI-54, HF, MSU.

C. niger is one of the four most abundant and widespread tabanid species in West Virginia. Philip (1947) reported records from all of the surrounding states. Pechuman, in 1964, was aware of West Virginia records while compiling data for the description of *C. calvus* and subsequently re-checked the earlier records for the possibility that these might be *C. calvus*.

Chrysops nigrimbis Whitney

Other than records from two locations in MD and one in DC, this species is not known from the remaining states contiguous to West Virginia. It may occur in the Eastern Panhandle.

Chrysops obsoletus obsoletus Wiedemann

Although Philip (1947) lists this species from OH, PA, MD, and DC, Pechuman knows only of confirmed records from PA, NJ, NY, MD, and VA. The problem results from recent name changes and the separate distribution of the subspecies *lugens*. *Chrysops lugens* of authors, not Wiedemann, is actually *C. dacne* Philip, and *C. ultimus* Whitney is a synonym of *C. lugens lugens* Wiedemann. Philip clarified this matter when he described *C. dacne*. MONTGOMERY, MD, currently the nearest record, lies less than twenty miles east of West Virginia's Eastern Panhandle.

Chrysops parvulus Daecke

This species is common only in small localized areas, ranging from NJ to FL and west to AR.

Chrysops pikei Whitney

Seasonal Range—23-VI to 28-VII (30-V to 21-VIII). Distribution—BROOKE, Bethany, 10-VI-75, JH, WVDA. HAMPSHIRE, Grace, 28-VII-77, WM and KE, WVDA. KANAWHA, Kanawha Sta. 1918, SR, USNM. LEWIS, Jackson's Mill, 28-VII-75, JH, WVDA. RITCHIE, North Bend St. Pk., 23-VI-77, LB, WVU.

The national distribution of *C. pikei* was described by Philip (1965) as having an easternmost range along a line from Ontario to FL, which would include the western zones of this state. Pechuman (1973) mentions records from VA and suggests that it has probably moved north into VA during the past 40 years, leaving the mountainous areas of the eastern United States devoid of this species.

Chrysops pudicus Osten Sacken

This is primarily a coastal species, although it has been recorded inland. Again the nearby record from MD makes this species a likely addition to this state's list of records.

Chrysops reicherti Fairchild

The nearest confirmed records of this species are known from MD, VA, and IN. This species has not been reported north of MD and throughout its range occurs in highly restricted areas, or rather very locally.

Chrysops sackeni Hine

Seasonal Range—8-VI to 10-VII (5-VI to 25-VII).
Distribution—BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 8-VI-77, HT and LLP, CU. PRESTON, Craneyville Swamp, 10-VI-77, JA and TM, WVU. TUCKER, Dolly Sods, 3-VI-75, LB, WVU. WEBSTER, Cranberry Campground, 20-VI-75, BD, WVU.

These West Virginia records represent the southern range for this species as it has not been taken south of MD, OH, and IN except for a possible record from NC. It occurs in the mountainous areas of West Virginia, characteristic of many northern species occurring in this state.

Chrysops sequax tau Philip

Seasonal Range—10-VII to 18-VIII (28-VIII).
Distribution—BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 24-VII-76, BD, WVU. BROOKE, Bethany, 10-VII-75, JH, WVDA. HAMPSHIRE, Grace, 28-VII-77, CC, WVDA. SUMMERS, Pipestem St. Pk., 28-VII-76, TM, WVU.

Very little information pertaining to *C. s. tau* is available due to its recent separation from *C. s. sequax*. Williston. Pechuman (1973) explains that all "specimens reported as *C. sequax* from east of OH, including those of McAtee and Walton (1918) from MD and VA are either *C. beameri* or *C. hinei*." Specimens from BERKELEY show unusual variations from the described *C. s. tau* subspecies because they possess extremely short pollinose projections on the frontoclypeus. This projection is the key character separating this subspecies from *C. s. sequax*. The BERKELEY specimens also show reduced sublateral abdominal spots, and one specimen even possesses a yellow callus without black spots near the frontoclypeal pits.

Chrysops shermani Hine

Seasonal Range—10-VI to 25-VIII.
Distribution—BERKELEY, Sleepy Creek Publ.

Hunt. and Fish. Area, 2,3-VIII-75, BD, WVU. GREENBRIER, S. Fork Cherry River, 11-VII-76, BD, WVU. HANCOCK, Tomlinson Run St. Pk., 9-VI-76, BD, WVU. MINERAL, New Creek, 25-VI-76, BD, WVU. POCAHONTAS, Cranberry Glades, 16-VII-52, CWS, USNM. PRESTON, Craneyville Swamp, 10-VI-77, LB, WVU. RANDOLPH, Laurel Fork Campground, 8,9-VIII-75, BD, WVU.

This species is found primarily in the hilly and mountainous areas of the state, and is also known from PA and VA.

Chrysops striatus Osten Sacken

Philip (1947) published records from PA, VA, DC, and OH. However, this report was corrected in 1950, and all but the OH records proved to be *C. aberrans* (Philip 1950b). This is a northern species, and records closest to West Virginia are from extreme northern counties in OH and PA which delimit its southern range. Disjunct colonies might occur in West Virginia's mountainous regions.

Chrysops univittatus Macquart (Prior to 1961, *C. univittatus* of authors, not Macquart, was the name used for *C. macquarti* Philip)

Seasonal Range—9-VI to 18-VIII (26-V to 9-IX).
Distribution—BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 2-VIII-75, BD, WVU. BROOKE, Bethany, 10-VII-75, JH, WVDA. GREENBRIER, Sherwood Lake, 12-VIII-75, BD, WVU. HAMPSHIRE, Grace, 28-VII-77, CC, WVDA. HANCOCK, Tomlinson Run St. Pk., 9-VI-76, BD, WVU. HARDY, Warden Lk., 24-VII-76, BD, WVU. KANAWHA, SR, USNM. LEWIS, Jackson's Mill, 24-VII-78, JH, WVDA. MASON, Rt. 2, S. Co. Line, enclosed 8-VII-76, BD, WVU. MINERAL, New Creek, 11-VI-76, BD, WVU. MINGO, 5 mi. N. Williamson, 19-VII-76, BD, WVU. MONONGALIA, Dent's Run, 17-VI-75, BD, WVU. PRESTON, 24-VI-75, BD, WVU. OHIO, Bear Rocks Lk., 17-VIII-77, JH, WVDA. SUMMERS, Pipestem St. Pk., 9-VI-77, JH, WVDA. WEBSTER, Cranberry Campground, 11-VII-76, BD, WVU. WETZEL, Lewis Wetzel Publ. Hunt. Area, 18-VI-76, BD, WVU.

This species was listed from all of the contiguous states by Philip (1947), although it was listed as *C. wiedemanni*. It is widespread throughout West Virginia, but large numbers were rarely collected except at a few locations from late June through late July.

C. univittatus is a successful biter, able to approach noiselessly. It is usually not detected until one experiences the distinctive sharp pain produced when this insect feeds.

Chrysops upsilon Philip

This southeastern species is not known from West Virginia, although it might occur in the lower areas. Records are known from MD, VA, and KY.

Chrysops vittatus Wiedemann

Seasonal Range—8-VI to 18-VIII (4-V to 9-IX).

Distribution—BARBOUR, Philippi, 22-VII-61, DV, VPI. BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 2-VIII-75, BD, WVU. HAMPSHIRE, Capon Bridge, 6-VIII-77, PV, WVDA. HANCOCK, Tomlinson Run St. Pk., 9-VI-76, BD, WVU. HARDY, Moorefield, 30-VII-75, PV, WVDA. HARRISON, 12-VII-75, BD, WVU. LINCOLN, Garrets Bend, 16-VIII-77, KH, WVDA. MASON, McClintic Wildlife Sta., 7-VII-77, CC, WVDA. MINERAL, New Creek, 9-VI-76, BD, WVU. MINGO, 5 mi. N. Williamson, BD and PF, WVU. MONONGALIA, Dents Run, 17-VI-75, BD, WVU. PENDLETON, Germany, 16-VII-75, JH, WVDA. POCAHONTAS, Cranberry Glades, 9-VIII-76, LB, WVU. PRESTON, 31-VII-75, BD, WVU. RANDOLPH, Shaver's Fk. near Cheat Bridge, 15-VII-36, GK, CM. TUCKER, Olson Bog, 10-VIII-76, BD, WVU. WEBSTER, Cowen, VII-34, LLP, LLP.

Pechuman (1972) reports this species to be the most abundant in the low lying wooded areas in NY. In West Virginia it is present throughout the state. In fact, *C. vittatus* scores the highest Index of Abundance rating of all *Chrysops*, a conclusion also agreeing with observations from PA, VA, and MD.

Genus *NEOCHRYSOPS*

Neochrysops globosus Walton

This species, the only member of the genus, is known from seven specimens collected in MD (type), DE, AL, TN, and MS (Goodwin, 1976b). Such a sporadic and wide distribution may include West Virginia.

Subfamily TABANINAE Stone

Tribe *Diachlorini*

Genus *DIACHLORUS*

Diachlorus ferrugatus (Fabricius)

This tabanid is most common in coastal areas from FL to NJ. Specimens from inland locations in KY and IN indicate that it may well occur in West Virginia.

Genus *MICROTABANUS*

Microtabanus pygmaeus (Williston)

This is another "rare" tabanid and the only member of this genus. It is known from DE, VA, NC, and, possibly, NY. Philip *et al.* (1973) reported that in FL, *M. pygmaeus* is a nocturnal feeder and suggested that

it feeds on birds and mice on Navarre Beach. Its nocturnal habits may explain its rare occurrence in collections and its spotty distribution.

Genus *CHLOROTABANUS* Lutz

Chlorotabanus crepuscularis (Bequaert)

The range of this tabanid is sporadic from DE and TN south to FL and west to TX. The nearest records are from MD and VA. Thus, it may occur in West Virginia. Because of its crepuscular habits, this fly is not often collected by conventional tabanid survey techniques.

Genus *LEUCOTABANUS* Lutz

Leucotabanus annulatus (Say)

Seasonal Range—2-VIII (15-VII to 20-VIII).

Distribution—LINCOLN, Big Ugly Publ. Hunt. Area, 2-VIII-78, LB, WVU.

This species was previously known from scattered records from MD, VA, and KY. Philip also published records from OH and PA (Philip, 1966 and 1950a, b, respectively). The WV specimen was swept at dusk, indicating crepuscular or nocturnal behavior for *L. annulatus*.

Tribe *Haematopotini* Meigen

Genus *HAEMATOPOTA* Meigen

Haematopota rara Johnson

Seasonal Range—10-VI (4-VI to 5-VII).

Distribution—MONONGALIA, Joe's Run, 10-VI-76, BD, WVU.

This distinctive, uncommon, but widespread species has previously been reported from all of the surrounding states except KY. Another species, *H. champlaini*, has been collected in DAUPHIN, PA. *H. champlaini* is known only from female specimens from PA and RI. These two *Haematopota* may be separated as follows (Frost and Pechuman 1958):

a. First antennal segment distinctly swollen, without dorsal notch; pale rings of tibiae narrow; pale apical wing band reaches posterior margin of wing; length 7 to 8mm

.....*rara* (Johnson)

b. First antennal segment barely swollen, with a strong basal notch near apex; pale rings of tibiae broad; pale apical wing band not reaching posterior margin of wing; length 9mm

.....*champlaini* Philip

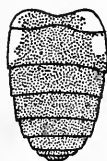
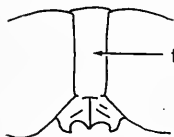
KEY TO SPECIES OF WEST VIRGINIA *ATYLOTUS*

Tribe *Tabanini*

Genus *ATYLOTUS* Osten Sacken

The following key is a modification of that of Pechuman (1972) with additions from Stone (1938). Illustrations are made from specimens in possession of the authors.

1. a. Pleural hairs bright yellow; basal portion of third antennal segment about as broad as long
..... *bicolor* (Wiedemann)
- b. Pleura gray; basal portion of third antennal segment variable, slender to broad
..... 2
2. a. Hair of abdomen whitish (some males have median patches of black hair); if yellow hairs are present laterally, more than half of hind femur is black; frons(f) of female moderate in width; eye of both sexes in life usually with a diagonal band; basal portion of third antennal segment stout, with dorsal angle prominent and near middle of length
..... *ohioensis* (Hine)
- b. Hair of abdomen yellow; femora variable, completely yellow to half black; frons of female rather narrow; eye with or without band in life; basal portion of third antennal segment moderately elongate, the dorsal angle straight and basad of middle
..... 3
3. a. Abundant black hair on palpi (p) and prescutal lobe; abdomen in female dark brown, narrowly yellowish on sides of first two segments; hair of venter often white on first two segments; genae yellowish at least on upper portions; eye often with band in life; usually over 10mm in length
..... *pematicus* (Johnson)
- b. Only scattered black hairs on palpi and prescutal lobe; abdomen in female usually fuscous in center, broadly yellowish on sides; hair of venter mostly yellow; genae usually gray with gray hairs; no eye band in life; usually under 10mm in length
..... *thoracicus* (Hine)



Atylotus bicolor (Wiedemann)

Seasonal Range—8-VI to 7-VII (10-X).

Distribution—BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 8-VI-77, LLP, LLP. MONONGALIA, WVU Animal Husbandry Farm, 7-VII-75, BD, WVU.

This northern species has been reported as far south as DC, PA, NC, and VA but has rarely been found to be numerous. West Virginia records further delimit its southern range. Additional collecting in low lying, marshy areas may result in more instate records.

Atylotus ohioensis (Hine)

Seasonal Range—10-VI to 24-VII.

Distribution—HARDY, Warden Lake, 24-VII-76, BD, WVU. MONONGALIA, Joe's Run, 10-VI-76,

BD, WVU. WETZEL, Lewis Wetzel Publ. Hunt. Area, 18-VI-76, BD, WVU.

Philip (1947 and 1965) describes the southern range of this species from OH and PA. It is not reported from the other states around West Virginia, indicating that these new records redefine the southern range limit. It is not common anywhere in this area.

Atylotus pematicus (Johnson)

Seasonal Range—10-VI (1-VI to 24-VII).

Distribution—PRESTON, Cranesville Swamp, 10-VI-77, BD, WVU.

The specimen collected in Cranesville Swamp was identified by Pechuman as a form of *Atylotus* near *pematicus*. Teskey (1969) reared two larval types, producing adult specimens that both keyed to *A.*

pemeticus. Adults of one group of larvae were found by Pechuman to be closer to the holotype of *pemeticus* than the other, and Teskey refers to this group as "*Atylotus* species A." Although distinguishing morphological differences have not been found to separate these adults forms, *A. pemeticus* is presently being considered to represent a complex of more than one species. Forms similar to the Cranesville Swamp specimen have been found from SUMMIT, OH, and MONROE, PA, NY, and New England. Specimens are usually collected by sweeping vegetation in sphagnum bogs and swampy areas.

Atylotus thoracicus (Hine)

This is a widespread species reported from the northeastern states south to DE. Pechuman also has confirmed records from PA, OH, and KY. This fly is an inhabitant of open sphagnum bogs and should be found in West Virginia.

Genus *HAMATABANUS*

Hamatabanus carolinensis (Macquart)

This is a southern species which occurs as far north as MD. Also known from VA, KY, and OH, it should occur in West Virginia.

Genus *HYBOMITRA*

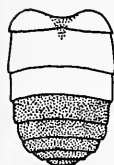
Philip (1941) discussed the separation of *Hybomitra* from *Tabanus* using characters of hairy eyes and ocelligerous tubercles, and the treatment of those species which possess only one of these characters. Thompson (1967a,b) and Pechuman (1972, 1973) have utilized this genus in their respective statewide surveys based on the catalog of Philip (1947).

Hybomitra is generally a northern genus, although a few species are found south to FL. In West Virginia, few of the species are numerous and most of them, like most species of *Tabanus*, do not readily attack man; *H. difficilis* occurring in wooded areas, is an exception.

The keys which follow were modified from those of Pechuman (1972). A separate key is used for males due to their contiguous, generally hairier eyes and the subsequent lack of median cephalic characteristics. Females of *H. cincta* and *H. difficilis* have practically bare eyes. All species have an ocellar tubercle.

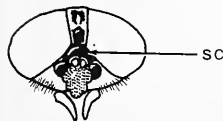
KEY TO SPECIES OF WEST VIRGINIA *HYBOMITRA*

I. FEMALES



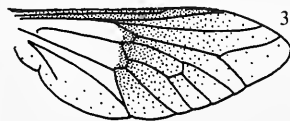
1. a. Black species with first 3 abdominal segments mostly bright orange
.....*cincta* (Fabricius)

- b. Abdomen not so marked
.....2



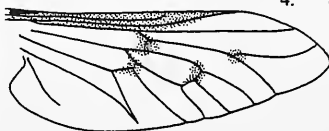
2. a. Subcallus (sc) denuded and shining
.....3

- b. Subcallus pollinose
.....5



3. a. Subcallus swollen; whole face below eyes denuded and shining; small species with dark wing pattern
.....*hinei* (Johnson)

- b. Subcallus normal; face below eyes not shining
.....4

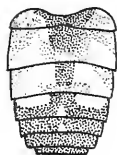


4. a. Abdomen broadly orange-brown laterally, the median black area usually constricted; eyes hairy; all cross veins strongly spotted with brown
.....*lasiophthalma* (Macquart)



- b. Abdomen not broadly orange-brown laterally; eyes apparently bare; basal portion of third antennal segment narrow; cross veins not spotted

..... *difficilis* (Wiedemann)

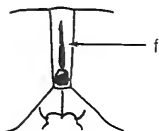


5. a. Abdomen broadly orange-brown laterally. Median black area usually constricted on third segment

..... 6

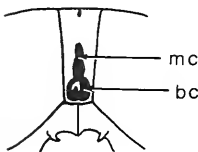
- b. Abdomen not as above; if paler laterally, median dark area of third segment broad and not constricted

..... 7



6. a. Second palpal (p) segment stout, especially at base; frons (f) about 5 times as high as width at base, widened above; basal portion of third antennal segment mostly orange and about two-thirds as wide as long

..... *epistates* (Osten Sacken)



- b. Second palpal segment slender; frons not more than $3 \frac{1}{3}$ to 4 times as long as greatest width; basal callus (bc) rounded above and often joined to median callus (mc); basal portion of third antennal segment rather slender and not deeply excised; hind tibial fringe usually black but sometimes extensively yellow

..... *aurilimba* (Stone)



7. a. Abdomen black with a median row of distinct white triangles and no sublateral spots

..... 8

- b. Abdomen otherwise marked

..... 9



a

8. a. Third antennal segment sharply bicolored, basal portion entirely orange, annuli black; wing heavily and rather uniformly darkened

..... *trispila* (Wiedemann)



- b. Basal portion of third antennal segment partially black; infuscation of wing not uniform and not very dark

..... *sodalis* (Williston)



a

9. a. Second palpal segment slender, scarcely thickened at base

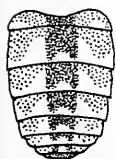
..... 10

b. Second palpal segment stout, especially so at base

..... 12



b



10. a. Femora, except base of hind femora, brown; sides of abdomen reddish brown; second palpal segment extremely slender; third antennal segment practically without dorsal excision
..... *miniscula* (Hine)

b. Femora usually black; if brown, sides of abdomen not with considerable orange brown

..... 11

11. a. Hair of palpi long and uneven, semi-erect; base of third antennal segment narrow; hind femora black on basal half, remainder brown

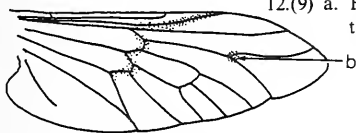
..... *frosti* Pechuman

b. Hair of palpi short and lying smoothly against segment; base of third antennal segment not very narrow; hind femora brownish to completely black

..... *pechumani* Teskey and Thomas

- 12.(9) a. Bifurcation (b) of third longitudinal vein with a distinct spot; third antennal segment stout

..... *illota* (Osten Sacken)



b. Bifurcation without a distinct spot, third antennal segment slender; legs nearly uniformly brownish, rarely femora somewhat darker; prescutal lobe black

..... *microcephala* (Osten Sacken)

II. MALES

1. a. Stiff hairs along midline between eyes
..... *difficilis* (Wiedemann)

b. No stiff hairs along midline between eyes

..... 2

2. a. Black species with first abdominal segments mostly bright orange

..... *cincta* (Fabricius)

b. Abdomen not so marked

..... 3

3. a. Small dark species with gray, protuberant frontal triangle; genae black, somewhat shining; dark cloud on wing near stigma

..... *hinei* (Johnson)

b. Differing in one or more characters from above

..... 4

4. a. Cross veins and bifurcation of third longitudinal vein with distinct dark spots; abdomen broadly orange laterally
.....*lasiophthalma* (Macquart)
- b. Wings entirely hyaline, tinted or with dark spot only on bifurcation
..... 5
5. a. Abdomen black, obscurely reddish laterally but no distinct sublateral spots, a conspicuous row of white median triangles
..... 6
- b. Abdomen not so marked
..... 7
6. a. Third antennal segment sharply bicolored, basal portion orange, annuli black; line of demarcation between large upper eye facets and smaller lower facets fairly distinct
.....*trispila* (Wiedemann)
- b. Basal portion of third antennal segment partly darkened; upper eye facets only slightly enlarged and gradually merging with smaller lower facets
.....*sodalis* (Willston)
7. a. Small species, not over 12mm, with very slender palpal segment; sides of abdomen broadly dark orange but first segment usually completely black; third antennal segment with very shallow dorsal excision
.....*miniscula* (Hine)
- b. Species over 12mm, but if smaller, second palpal segment stout and dorsal excision distinct
..... 8
8. a. Prescutal lobe black; femora brown; second palpal segment stout
.....*microcephala* (Osten Sacken)
- b. Prescutal lobe reddish at least on disc
..... 9
9. a. Abdomen broadly orange brown laterally, median black area constricted on third segment and not divided by a pale, longitudinal line; first sternite orange, occasionally with small dark area in center
..... 10
- b. Abdomen not broadly orange laterally; orange sublateral spots may be present but black area on third segment is not constricted
..... 11
10. a. Third antennal segment including annuli reddish; second palpal segment very stout, only slightly longer than thick
.....*epistates* (Osten Sacken)
- b. Third antennal segment with at least annuli black; second palpal segment yellow, about twice as long as thick; base of third antennal segment slender and shallowly incised; usually 16mm or more; median black area of abdomen usually much reduced
.....*aurilimba* (Stone)
11. a. Bifurcation of third longitudinal vein with distinct dark spot; palpi very stout; hind tibia dark reddish brown to black; abdomen narrowly yellowish laterally; costal cell and basal portion of wing lightly infuscated; outer claw of fore tarsi about 1/3 longer than inner claw
.....*illota* (Osten Sacken)

12. a. Head relatively small, eye facets scarcely differentiated; second palpal segment brown, paler at apex, somewhat clavate; hind femora brown, basal halves darkened

.....*frosti* Pechuman

- b. Head relatively large, eye facets rather distinctly differentiated; second palpal segment yellow to brown rather cylindrical; hind femora variable, often completely black

.....*pechumani* Teskey and Thomas

Hybomitra aurilimba (Stone)

Seasonal Range—3-VII (VII to early VIII).

Distribution—TUCKER, Dolly Sods, 3-VII-75, LB and DB, WVU (one male and one female).

The female of this species was captured by sweeping cattle while approaching them closely in a truck; the cattle were less disturbed when approached in this manner. The male specimen was swept in late afternoon from its hovering position along a cliff about 2-4 ft. above an outcropping. Another male was spotted nearby but was not taken. These observations agree with those of Bickler (1955) for hovering males.

Hybomitra cincta (Fabricius)

Seasonal Range—1-VII (22-VI to 14-VIII).

Distribution—MONONGALIA, Chestnut Ridge, Harris Lake, 1-VII-75, LB and BD, WVU. PRESTON, Brandonville Pike at Muddy Creek, 1-VII-75, LB and BD, WVU.

This attractive tabanid has been reported from all of the contiguous states. Male hovering behavior reported by Pechuman (1972, 1973) was confirmed by observation and capture in mid-afternoon of a male hovering in a small sunlit clearing in an area of low bush and scattered trees near a fast-flowing stream. A long series of female *H. cincta* was recently taken by Amrine of WVU. The females were alighting on the heads of persons swimming in a pond at Chestnut Ridge, Monongalia County.

Hybomitra difficilis (Wiedemann)

Seasonal Range—9-V to 29-VII (16-VIII).

Distribution—BARBOUR, Junior, 2-VI-78, LB, WVU. BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 28-V-76, BD, WVU. BRAXTON, Kanawha Run-Sutton Lk., 28-V-78, LB, WVU. BROOKE, Castleman Run Lk., 9-VI-76, BD, WVU. FAYETTE, Rainelle, 12-VI-77, TK, WVU. GILMER, Cedar Ck. St. Pk., 4-VI-77, LB, WVU. GRANT, Greenland, 7-VII-78, CC, WVDA. GREENBRIER, White Sulphur Springs, 9-V-70, AC, WVDA. HAMPSHIRE, Capon Bridge, 24-VI-75, CC, WVDA. HANCOCK, Tomlinson Run St. Pk., 9-VI-76, BD, WVU. HARDY, Moorefield, 29-V-76, WN and KE, WVDA. HARRISON, 1-VI-76, CS, WVU. JEFFERSON, Shannondale, 1-VI-77, JH, WVDA. KANAWHA, Kimberly Rd., 17-VI-76, SF, WVDA.

MCDOWELL, Panther St. For., 21-V-77, LB, WVU. MARION, Bunner's Ridge, 22-VI-75, TM, WVU. MASON, McClintic Publ. Hunt. and Fish. Area, 21-V-76, BD, WVU. MINERAL, Burlington, Shale Barrens, 24-V-77, LB, WVU. MONONGALIA, Triune, 28-V-76, LB, WVU. MORGAN, Cherry Run, 6-VI-78, CC, WVDA. PLEASANTS, Bens Run, 25-V-77, JH, WVDA. POCAHONTAS, Boyer, 9-VI-76, CC, WVDA. PRESTON, Etam, 20-V-76, BD, WVU. RANDOLPH, Stuart Rec. Area, 16-VI-73, FR, CU. RITCHIE, North Bend St. Pk., 23-VI-77, LB, WVU. ROANE, 2 mi. W. Spencer, 27-V-78, LB, WVU. SUMMERS, Pipestem St. Pk., 13-V-76, PG, WVDA. TAYLOR, Grafton, 8-VI-52, CVS, CM. TUCKER, Dolly Sods, 29-V-78, JA, WVU. WAYNE, Cabwaylingo St. For., 21-V-77, LB, WVU. WETZEL, Lewis Wetzel Publ. Hunt. Area, 18-VI-76, BD, WVU. WYOMING, Pineville, 20-V-77, LB, WVU.

Most West Virginia records are from late May through early July. This species is especially annoying and, together with *H. lasiophthalma*, presents serious problems to cattle and people during the month of June. This species is abundant and actively attacks man in wooded areas. Even though this is a common species as an adult, larvae have never been observed.

Hybomitra epistates (Osten Sacken)

This is a northern species which is not known south of a line from northern NJ to central OH. It may occur in northern and mountainous areas in West Virginia.

Hybomitra frosti Pechuman

Of the surrounding states, this species has been found only in central PA. It is a newly described species with obscure habits, but may occur in disjunct colonies in West Virginia sphagnum bogs.

Hybomitra hinei (Johnson)

Records from MD, VA, and PA indicate the probable occurrence of this bog-dwelling species in West Virginia.

Hybomitra illota (Osten Sacken)

This northern species occurs in OH, PA, and MD, but is generally not common south of NY.

Hybomitra lasiophthalma (Macquart)

Seasonal Range—12-V to 12-VII (12-IV to 27-VII). Distribution—BARBOUR, Pleasant Ck., 12-V-77, LB, WVU. BERKELEY, Sleepy Creek Publ. Hunt.

and Fish. Area, 28-V-76, BD, WVU. BROOKE, Castleman Run Lk., 9-VI-76, BD, WVU. CALHOUN, Rt. 33, 2 mi. E. County line, 27-V-78, LB, WVU. GILMER, Cedar Ck. St. Pk., 4-VI-77, LB, WVU. GRANT, Greenland, 31-V-78, CC, WVDA. GREENBRIER, Clendinsville, 18-VI-76, JH, WVDA. HAMPSHIRE, Grace, 25-V-76, WN and KE, WVDA. HANCOCK, Tomlinson Run St. Pk., 9-VI-76, BD, WVU. HARDY, Moorefield, 12-V-67, WVDA. JACKSON, Ripley, 22-V-75, JH, WVDA. JEFFERSON, Shannondale, 7-VII-78, CC, WVDA. KANAWHA, St. Albans, 5-VI-76, JH, WVDA. MASON, Point Pleasant, 5-VI-75, JH, WVDA. MINERAL, New Creek, 11-VI-76, BD, WVU. MONONGALIA, Morgantown, 15-V-75, BD, WVU. MORGAN, Cherry Run, 31-V-78, CC, WVDA. OHIO, Bear Rocks Lk., 25-V-77, JH, WVDA. PENDLETON, Seneca Campground, 23-VI-76, BD, WVU. PLEASANTS, Ben's Run, 25-V-77, JH, WVDA. POCAHONTAS, Boyer, 9-VI-76, CC, WVDA. PRESTON, Reedsville Exp. Sta., 23-V-77, LB, WVU. RANDOLPH, Rt. 219, 5 mi. N. Elkins, 5-VI-76, BD, WVU. RITCHIE, N. Bend St. Pk., 23-VI-78, JH, WVDA. ROANE, 2 mi. W. Spencer, 27-V-78, LB, WVU. SUMMERS, Pipestem St. Pk., 13-V-76, PG, WVDA. TUCKER, Blackwater Falls, 12-VII-78, JH, WVDA. WEBSTER, Cranberry Campground, 20-VI-75, BD, WVU. WETZEL, Lewis Wetzel Publ. Hunt. Area, 18-VI-76, BD, WVU. WOOD, V-50, UA.

This attractive tabanid is known from all of the surrounding states, and is the most abundant of the *Hybomitra* in West Virginia, where it is an important early season pest.

Hybomitra microcephala (Osten Sacken)

Seasonal Range—1-VII to 18-VIII (8-VI).
Distribution—MONONGALIA, I-VII, LMP, WVU. PRESTON, Cranesville Swamp, 18-VIII-76, LB and BD, WVU. RANDOLPH, Laurel Fk. Campground, 8-VIII-75, BD, WVU.

West Virginia lies along the southern range of *H. microcephala*, which occurs south of the state only in mountainous areas. It is known from the contiguous states of OH, PA, and VA.

Hybomitra miniscula (Hine)

Seasonal Range—10-VIII to 18-VIII (10-VII).
Distribution—PRESTON, Cranesville Swamp, 18-VIII-76, LB and BD, WVU. TUCKER, Olson Bog, 10-VIII-76, BD, WVU (Teneral male).

This slow-flying species is known to exist only in or around sphagnum bogs, an observation confirmed by this study. *H. miniscula* does not occur south of West Virginia, which contains the southernmost sphagnum bogs. Records are also known from OH and PA.

This small *Hybomitra* is characteristic in its habits. While collecting at Cranesville Swamp, the authors observed its slow flight, rarely more than 2/3 meter

above the ground. It was readily caught with a sweep net and responded well to the CO₂ baited modified malaise traps with targets. Females followed the collectors and attempted to land on their wet, dark green hip boots. Several hovering males were also taken during the middle of the day.

Hybomitra sodalis (Williston)

Seasonal Range—27-VI to 6-VIII (25-VI).
Distribution—GRANT, Greenland, 13-VII-78, CC, WVDA. HAMPSHIRE, Grace, 7-VII-77, CC, WVDA. HARDY, Warden Lk., 24-VII-76, BD, WVU. PENDLETON, Spruce Knob, 5-VIII-60, HM and GW, CM. POCAHONTAS, Cranberry Glades, 16-VII-55, CWS, USNM. RANDOLPH (?), near Cheat Mt., 6-VIII-60, HM and GW, CM. SUMMERS, Pipestem St. Pk., 28-VII-76, TM, WVU. UPSHUR, Stonecoal Lk., 27-VI-77, PV, WVDA. WEBSTER, Cranberry Campground, 11-VII-76, BD, WVU. WETZEL, New Martinsville, 6-VII-76, TM, WVU.

H. sodalis was recently separated from *H. trispila* by Pechuman (1960), and earlier records are in need of revision. To date *H. sodalis* is known from PA, MD, KY, VA, and NJ, and has been taken in all but the central and southwestern geographical zones in West Virginia. It is more commonly encountered in mountainous areas.

Hybomitra trispila (Wiedemann)

Although *H. trispila* and *H. sodalis* have been found to fly together, *H. trispila* is on the wing earlier and is often found at lower elevations than *H. sodalis*. It is known from all of the contiguous states except OH and will probably be found in West Virginia.

Hybomitra pechumani Teskey and Thomas

Seasonal Range—10-VI to 26-VII.
Distribution—MINERAL, New Creek, 25-VI-76, BD, WVU. MONONGALIA, 27-VI, WVU (male). PRESTON, Terra Alta, 29-VI-18, SR, USNM (male dark form). RANDOLPH, Roaring Plains, 26-VII-76, LB and BD, WVU. TUCKER, Dolly Sods, 3-VII-75, LB, WVU.

This is a newly described species, the members of which were previously considered to be *H. typhus* (Whitney). All *typhus*-like forms collected in West Virginia are apparently *H. pechumani*.

Genus *TABANUS* Linn.

The genera *Hybomitra* and *Tabanus* comprise the group generally known as "horse flies." Most of these species are not known to attack man. Thompson (1967a, b, 1969) in surveying for tabanids of MD was bitten by *T. lineola*, *marginalis*, *pumilus*, and *quinquevittatus*. Pechuman (1972, 1973) also reports being attacked by *T. sparus milleri*. Drees on more than one occasion has been attacked by *T. pumilus* and *sparus milleri* and has observed *T. sulcifrons* attacking swimmers emerging from the lake in Cacapon State Park, 2 August 1975. The first author also collected *T.*

americana in MINGO after it landed on his blue jeans. Larger tabanids are unsuccessful feeders on humans due to their noisy approach. This genus is very important with regard to wild and domestic animals, although it is impossible to accurately place economic values on the damage done.

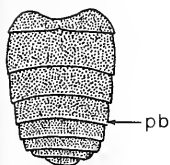
Taxonomic Discussion and Use of Keys. The following keys largely follow those of Pechuman (1972, 1973), although a few couplets were incorporated from Stone (1938). Separate keys are given for females and males because of the lack of median cephalic characteristics due

to contiguous eyes in the latter. Males of *T. longus* are not yet known. Most of the structural characters for the separation of *Tabanus* species are confined to the head and its appendages. Eye color is used only for the separation of *Tabanus pumilus*, *T. sparus*, and *T. sparus milleri*, although it has been utilized in the past for other species. Female *Tabanus* are often identified by their characteristic frons structures, the median and basal callus. In the male, the frontal triangle lies directly below the contiguous eyes and above the antennae.

KEY TO SPECIES OF WEST VIRGINIA *TABANUS*

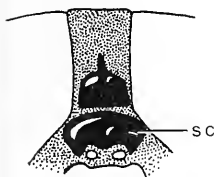
1. FEMALES

1. a. Abdomen unicolorous or with narrow indistinct posterior bands (pb) 2



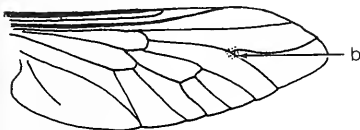
- b. Abdomen with one or more median triangles or median stripe 10

2. a. Subcallus (sc) denuded; mesoscutum entirely black; wing uniformly dark brown to black *atratus atratus* Fabricius



- b. Subcallus not denuded 3

3. a. Bifurcation (b) with a distinct spot or entire wing dark 4



- b. Bifurcation without a distinct spot, wing essentially hyaline 9

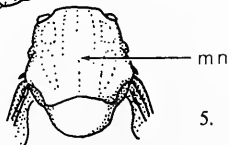
4. a. Palpi dark brown to black 5



- b. Palpi (p) pale to reddish brown; all femora black; first posterior cell (pc1) narrowed at wing margin; thorax with a lavender cast *gladiator* Stone

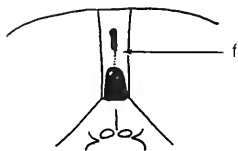


5. a. Mesonotum (mn) white pollinose 6

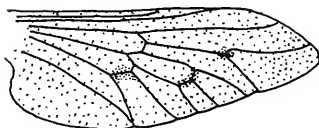


b. Mesonotum dark brown

.....7

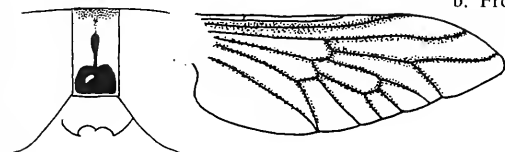


6. a. Frons (f) orange-brown, moderate in width; wing veins not margined with brown although darker clouds may be present
.....*stygius* Say



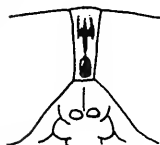
b. Frons gray, broad; wing veins margined with brown

.....*subniger* Coquillett



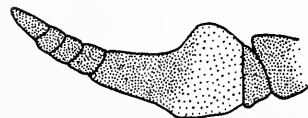
7. a. Frons narrow, widened above; antennae mostly orange, including first two segments

.....*proximus* Walker



b. Frons wider, parallel sided; first two antennal segments black and third often partly black

.....8



8. a. Wings mostly hyaline, with dark spots; abdomen without bloom
.....*nigrescens* Palisot de Beauvois



b. Wings rather uniformly dark or with veins broadly outlined with dark infuscation; abdomen brownish black with bluish-white bloom

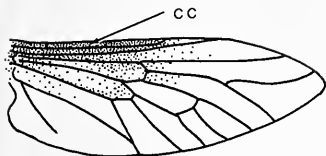
.....*aranti* Hays





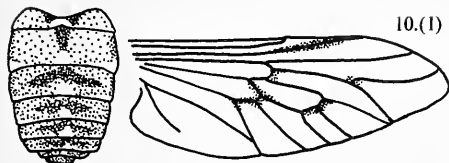
- 9.(3) a. Wing hyaline with a dark brown costal cell (cc); abdomen usually with narrow gray posterior borders

.....*americanus* Forster



- b. Wing uniformly dilutely infuscated; costal cell yellow; abdomen sometimes with traces of small median triangles

.....*calens* Linnaeus

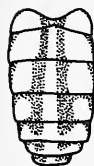


- 10.(1) a. Abdomen orange brown with median dark area; wings spotted; femora black

.....*abdominalis* Fabricius

- b. Abdomen with pale median stripe or spots

..... 11

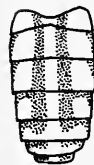


11. a. Abdomen with a longitudinal median stripe which may or may not be widened at posterior margins of segments; abdomen with sublateral stripes or spots; if under 15mm, dark brown with median triangles arising from pale bands, front tibiae unicolorous and subcallus shining; (see couplet 43a)

..... 12

- b. Abdomen with median markings not forming an uninterrupted stripe; abdomen with or without sublateral stripes or spots

..... 26



12. a. Spots forming median abdominal stripe nearly parallel sided; lateral markings usually form a shorter stripe on each side of median stripe and parallel to it but this stripe may be broken into separate spots or obsolete

..... 13



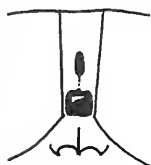
- b. Spots forming median stripe widened at posterior margin of abdominal segments; lateral markings broken into separate, often roundish spots

..... 18

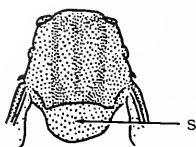


13. a. Prescutal lobe usually paler than mesonotum; frons widened above; annulate (a) portion of third antennal segment usually shorter than basal plate (bp); costal cell usually hyaline; eye in life with 2 purple bands

..... 14



- b. Prescutal lobe concolorous with rest of mesonotum; frons nearly parallel sided; annulate portion of antennal segment usually longer than basal plate; costal cell infuscated; eye in life with a single purple band
..... 16

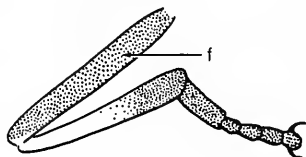
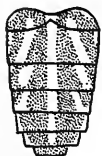


14. a. Scutellum (s) and thorax concolorous *lineola* Fabricius

- b. Scutellum reddish, sometimes faintly on posterior margin
..... 15



15. a. Legs predominantly reddish; sublateral abdominal stripes essentially parallel sided
..... *similis* Macquart

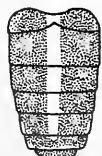


- b. Femora (f) of at least fore and hind legs darkened; sublateral abdominal stripes offset between second and third segments
..... *subsimilis subsimilis* Bellardi

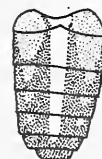


- 16.(13)a. Palpi, pleurae and costal cell yellow
..... *quinquevittatus* Wiedemann

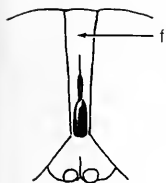
- b. Palpi white; pleurae gray, sometimes with a yellowish tint; costal cell pale yellow to dark brown, brownish or blackish species
..... 17



17. a. Costal cell dark brown; pleurae very pale, strongly contrasting with dark thoracic dorsum; frons about 4 to 4½ times as high as width at base
..... *fuscicostatus* Hine



- b. Costal cell yellow; pleurae scarcely contrasting with dorsum of thorax; frons 3½ to 4 times as high as wide
..... *mularis* Stone



- 18.(12)a. Dorsum of thorax covered with yellow hairs, without longitudinal stripes; abdominal stripes yellow; frons (f) very narrow; antennal plate broad; costal cell colored

..... 19

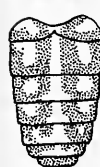
- b. Without this combination of characters

..... 20



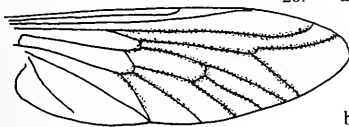
19. a. Annulate portion of third antennal segment black; femora dark; palpi yellow; face and pleurae yellow-haired

.....*fulvulus* Wiedemann



- b. Third antennal segment usually entirely orange yellow; femora pale sometimes darkened at base; palpi white; face and pleurae pale-haired

.....*pallidescens* Wiedemann



20. a. All wing veins margined with brown

.....*gracilis* Wiedemann

- b. Wing hyaline

..... 21



21. a. Third antennal segment uniformly yellow brown

.....*zythicolor* Philip

- b. Annulate portion of third antennal segment black

..... 22



22. a. Frons narrow, widened above

.....*sackeni* Fairchild

- b. Frons broader, parallel sided

..... 23



23. a. Basal plate (bp) of antennae about as wide as long; costal cell heavily infuscated

.....*longiusculus* Hine

- b. Basal plate longer than wide; costal cell hyaline or lightly infuscated

.....24



24. a. Second palpal segment (ps2) markedly swollen basally; median abdominal stripe broad

.....*sagax* Osten Sacken



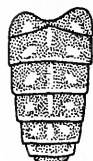
- b. Second palpal segment not markedly swollen basally; median abdominal stripe narrow

.....25



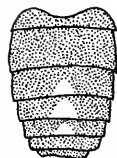
25. a. Pale markings of abdomen yellowish brown, the sublateral spots touching the hind margins of the segments

.....*sublongus* Stone



- b. Pale markings grayish, the sublateral spots small and separated from the hind margins

.....*longus* Osten Sacken



- 26.(11)a. No pale median spot on second abdominal segment but occasionally 2 small sublateral spots; fore tibiae distinctly bicolored; thorax white pollinose

.....*trimaculatus* Palisot de Beauvois

- b. Second abdominal segment with a pale median spot

.....27

27. a. Abdomen with both median and sublateral spots

.....28

- b. Abdomen without sublateral spots although abdomen may be paler laterally

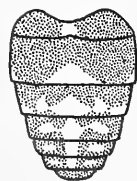
.....36

28. a. Bifurcation with a dark spot (see illustration for couplet 3)

.....29

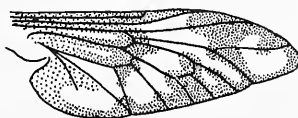
- b. Bifurcation without a dark spot

.....31



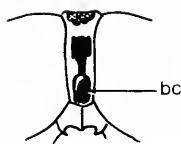
29. a. Wing with large brown maculations not confined to cross veins and bifurcation; lateral abdominal spots confined to posterior margins and often joined to median triangles

.....*venustus* Osten Sacken



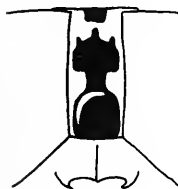
b. Wing not so colored and abdominal spots otherwise

..... 30



30. a. Median and sublateral spots broadly joined along base of abdominal segments; frons narrow, basal callus (bc) higher than wide

..... *cymatophorus* Osten Sacken



- b. Median and sublateral spots narrowly or not at all joined along base of abdominal segments; frons broad, basal callus almost square

..... *reinwardtii* Wiedemann

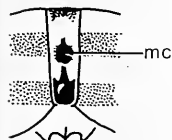


31. a. Small species, usually 12mm or less; frons widened above; costal cell hyaline

..... 32

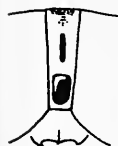
- b. Larger species, usually 13mm or more and differing in at least one other character from above

..... 34



32. a. Median callus (mc) large; palpi not swollen basally or sharply pointed; eye in life with 2 purple bands

..... *pumilus* Macquart



- b. Median callus slender; palpi swollen basally but with apex acute; eye in life unicolorous or with a single purple band

..... 33



33. a. Eye unicolorous in life

..... *sparus sparus* Whitney

- b. Eye with a single purple band

..... *sparus milleri* Whitney

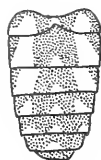


- 34.(31)a. First antennal segment swollen above; subcallus usually with a few lateral hairs

..... *fairchildi* Stone

- b. First antennal segment not swollen above; subcallus without lateral hairs

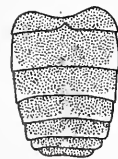
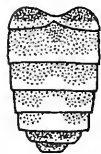
..... 35



a



b



35. a. Sublateral white abdominal spots considerably larger than the small median triangles and usually reaching anterior border of second and third segments
.....*marginalis* Fabricius
- b. Median triangles are relatively larger and sublateral spots smaller, rarely extending to anterior border of segments
.....*vivax* Osten Sacken
- 36.(27)a. Pale spot on second abdominal segment distinctly smaller than spots on third and fourth segments; scutellum with pale pile; fore tibia unicolorous
..... 37
- b. Pale spot on second segment not markedly smaller than those on two following segments
..... 39
37. a. Abdomen black with very small median triangles
.....*superjumentarius* Whitney
- b. Abdomen usually brownish, at least in part; median triangles large; middle and hind tibiae uniformly reddish brown; first and second longitudinal veins not margined with brown
..... 38
38. a. Genae, pleurae and venter pale haired
.....*molestus molestus* Say
- b. Genae, pleurae and venter brown haired
.....*molestus mixus* Philip
- 39.(36)a. No spot at bifurcation
..... 40
- b. Bifurcation with a conspicuous brown spot (see illustration for couplet 3)
..... 45
40. a. Wings with a smokey tinge; costal cell heavily colored; large species with median abdominal triangles small or obsolete
..... 41
- b. Wings hyaline; costal cell hyaline or slightly tinted, smaller species with conspicuous median triangles
..... 43
41. a. Fore tibia (t) bicolored
.....*novaescotiae* Macquart

b. Fore tibia unicolorous

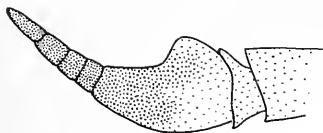
..... 42

42. a. Third antennal segment reddish yellow; median abdominal triangles faint and arising from faint posterior bands; first posterior cell narrowed toward margin (see illustration for couplet 9b)

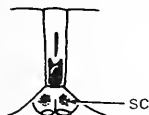
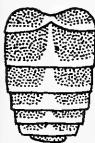
..... *calens* Linnaeus

- b. Third antennal segment partly black; median triangles small but distinct and not arising from bands; first posterior cell not narrowed

..... *catenatus* Walker



b



- 43.(40)a. Tibiae unicolorous although fore tibiae may be slightly paler at base; first posterior cell slightly or not at all narrowed at margin; subcallus (sc) thinly pollinose or denuded; usually under 15mm

..... *nigripes* Wiedemann

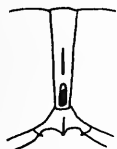
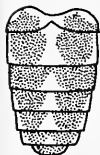
- b. At least fore tibiae bicolored; first posterior cell (pc1) much narrowed and may be closed or petiolate; subcallus pollinose; usually over 15mm

..... 44



44. a. Frons over 6 times as high as width at base; hind tibiae uniformly yellowish-white, barely darkened at apex; median triangle on second abdominal segment usually crossing segment and joining spot on first segment; first posterior cell usually closed, frequently petiolate

..... *petiolatus* Hine

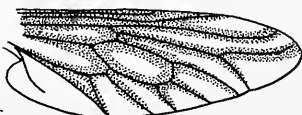
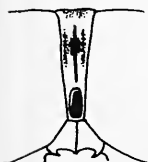


- b. Frons less than 6 times as high as wide; hind tibiae often extensively dark toward apex; median triangle rarely crossing second abdominal segment; first posterior cell rarely petiolate

..... *melanocerus* Wiedemann

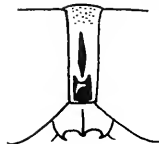
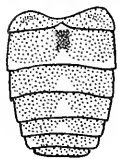
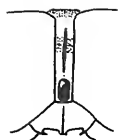
- 45.(39)a. Fore tibia (f) bicolored, basal portion pale

..... 46



- b. Fore tibia unicolorous or occasionally base somewhat brownish with orange hair; frons narrow, not less than 6 times as high as width at base and widened above; dark species with obvious mid-dorsal abdominal triangles. Wing rather heavily infuscated along longitudinal veins; pleurae paler than dorsum of thorax which is obviously striped; basal plate narrow

..... *turbidus* Wiedemann



46. a. Frons narrow, at least 5 times as high as wide; first posterior cell normally closed; all femora black (see illustration for couplet 10a)

.....*abdominalis* Fabricius

- b. Frons moderately wide, about 4 times as high as wide; first posterior cell normally open although often much narrowed at margin; at least middle femora brownish

.....*sulcifrons* Macquart

II. MALES (No *T. longus*)

1. a. Eyes hairy2
b. Eyes bare4
2. a. Abdomen with a conspicuous parallel sided median longitudinal white stripe and similar more irregular sublateral stripes*subsimilis subsimilis* Bellardi
b. Abdomen without a parallel sided median stripe3
3. a. Crossveins and bifurcation with distinct dark spots; first antennal segment not swollen above; hair on eyes heavy*reinwardtii* Wiedemann
b. Wing without distinct spots; first antennal segment strongly swollen above; hair on eyes sparse*fairchildi* (in part) Stone
4. a. Abdomen unicolorous or with narrow indistinct pollinose bands5
b. Abdomen with median markings12
5. a. Frontal triangle denuded and shining; third antennal segment with a rather long tooth; black species with heavily infuscated black wings*atratus atratus* Fabricius
b. Frontal triangle pollinose and differing in at least one other character from the above6
6. a. Bifurcation without a distinct spot7
b. Bifurcation with a distinct spot or wing mostly black8
7. a. Wing dilutely infuscated, costal cell darker; hind tibial fringe black*calens* Linnaeus
b. Wing hyaline, costal cell deep yellow; hind tibial fringe orange*americanus* Forster
8. a. Genae gray*proximus* Walker

- b. Genae grayish brown to black; blackish-brown to black species
..... 9
 - 9. a. Wing almost completely black or with broad heavy infuscation
along all veins; abdomen with whitish bloom
.....*aranti* Hays
 - b. Wing subhyaline
..... 10
- 10. a. Lower margin of area of large eye facets somewhat sinuate and at
lowest point about on level with top of antennal pits
.....*subniger* Coquillett
- b. Lower margin of large eye facets more nearly straight and
somewhat higher than antennal pits
..... 11
- 11. a. Integument of thoracic dorsum brown, contrasting with black
abdomen; wing membrane, except for spots, rather uniformly
dilutely infuscated
.....*stygius* Say
- b. Integument of thoracic dorsum dark brown to black, usually
contrasting only slightly with black abdomen; apex of wing,
except for spots, almost hyaline
.....*nigrescens* Palisot de Beauvois
- 12. (4)a. Abdomen broadly orange laterally with conspicuous black
median spots and no evident pale median markings; large and
small eye facets little differentiated; femora black; wings spotted
and first posterior cell narrowed or closed at wing margin
..... 13
- b. Abdomen with pale median markings and differing in at least
one other character from the above
..... 14
- 13. a. Thorax with a lavender tint, narrowly and inconspicuously
striped; second palpal segment slender, at least 3 times as long as
thick
.....*gladiator* Stone
- b. Thorax brown, broadly and conspicuously striped; second
palpal segment about twice as long as thick
.....*abdominalis* (in part) Fabricius
- 14. a. All veins outlined by a pale brown infuscation; third antennal
segment uniformly brownish; abdomen with a median row of
pale triangles which usually do not quite cross segments and with
pale sublateral spots; moderate sized species not over 16mm
.....*gracilis* Wiedemann
- b. Without the above characteristics
..... 15
- 15. a. Abdomen with a longitudinal stripe which may or may not be
somewhat widened at posterior margins of segments
..... 16
- b. Abdomen with median markings not forming an uninterrupted
stripe
..... 27
- 16. a. Spots forming median parallel sided abdominal stripe;
sublateral spots similar but often more irregular, rarely broken
into roundish spots
..... 17

- b. Median spots widened at posterior margin of each segment so that stripe is not parallel sided, sublateral spots usually roundish 21
- 17. a. Prescutal lobe usually paler than mesonotum; annulate portion of third antennal segment usually shorter than basal plate; costal cell usually hyaline 18
- b. Prescutal lobe usually concolorous with mesonotum; annulate portion of third antennal segment as long as or longer than basal plate; costal cell infuscated 19
- 18. a. Scutellum and thorax concolorous; hind femora usually dark *lineola* Fabricius
- b. Scutellum reddish or faintly reddish on posterior margin; hind femora usually reddish *similis* Macquart
- 19. a. Palpi, pleurae, and costal cell deep yellow *quinquevittatus* Wiedemann
- b. Palpi and pleurae grayish or white; costal cell deeply colored 20
- 20. a. Abdomen rather broadly reddish laterally; pleurae contrasting rather sharply with dark thoracic dorsum; large eye facets reaching occipital border with little reduction in size *fuscicostatus* Hine
- b. Abdomen narrowly reddish laterally; dark gray pleurae not sharply contrasting with thoracic dorsum; small eye facets extending upward along eye margin nearly reaching ocellar area *mularis* Stone
- 21.(16)a. Costal cell brown or dark yellow 22
- b. Costal cell hyaline or pale yellow 23
- 22. a. Third antennal segment sharply bicolored, basal plate orange, annuli black *longiusculus* Hine
- b. Third antennal segment uniformly orange-brown *zythicolor* Philip
- 23. a. Hair and pollen of pleurae and face yellow; area of large and small eye facets scarcely differentiated *fulvulus* Wiedemann
- b. Hair and pollen of pleurae and face pale; large and small eye facets distinctly differentiated 24
- 24. a. Third antennal segment entirely orange; long hairs on dorsum of thorax yellow *pallidescens* Philip
- b. Third antennal segment with at least annuli black; long hairs on dorsum of thorax gray to black 25
- 25. a. Costal cell hyaline; short recumbent hairs of thoracic dorsum gray; sublateral abdominal spots gray *sackeni* Fairchild

- b. Costal cell tinted; short hairs of thorax often yellowish; sublateral abdominal spots usually yellow or with a yellowish tint
..... 26
26. a. Median abdominal stripe broad; face below eyes with many black hairs, beard yellowish white; second palpal segment stout, yellow brown with many black hairs
..... *sagax* Osten Sacken
- b. Median abdominal stripe narrow; face with almost no black hairs, beard pale gray; second palpal segment relatively slender, pale yellowish white with few black hairs
..... *sublongus* Stone
- 27.(15)a. Frontal triangle bare and somewhat protuberant; abdominal triangles sometimes indistinct; small chunky species usually under 13mm
..... *nigripes* Wiedemann
- b. Frontal triangle pollinose
..... 28
28. a. Abdomen with at least some sublateral spots
..... 29
- b. Abdomen with no distinct sublateral spots, although some segments may be paler laterally
..... 36
29. a. First antennal segment swollen above; third antennal segment entirely black; eyes sometimes with sparse hairs
..... *fairchildi* Stone
- b. First antennal segment not swollen; third antennal segment variable; eyes bare
..... 30
30. a. Larger species, over 16mm
..... 31
- b. Smaller species, under 16mm
..... 32
31. a. Wing with a distinct spot at bifurcation
..... *cymatophorus* Osten Sacken
- b. Wing mottled with brown, the spots not confined to cross veins or bifurcation; tergites 2-4 with posterior white bands nearly obliterating the median and sublateral spots, but the spots distinct on tergite 4
..... *venustus* Osten Sacken
32. a. Wing with very faint to no spot at bifurcation; fore tibia entirely black; sublateral spots very large, often crossing second and third segments; third antennal segment black
..... *marginalis* Fabricius
- b. Fore tibia paler at base; sublateral spots smaller; third antennal segment rarely entirely black
..... 33
33. a. Moderate sized species, 14-15mm; second palpal segment yellow brown, about twice as long as wide; median triangles fairly large, sometimes crossing segment; sublateral spots reaching posterior margin on at least second segment; anterior portion of wing somewhat tinted
..... *vivax* Osten Sacken

- b. Small species usually under 11mm; second palpal segment whitish, less than twice as long as thick; median triangles small, never crossing segment; sublateral spots rarely reaching posterior margins of segments; wing entirely hyaline
..... 34
- 34. a. Tibiae same color as reddish-brown to brown femora or slightly paler basally; antennae yellowish, often with annulate portion somewhat darker; basal plate $2\frac{1}{2}$ to 3 times as long as wide; occipital tubercle prominent and often projecting above level of eyes
..... *pumilis* Macquart
- b. Tibia distinctly paler than dark femora, except apex of fore tibia which is dark; antennae uniformly dull brownish; basal plate about twice as long as wide; occipital tubercle inconspicuous and compressed, usually not reaching level of eyes
..... 35
- 35. a. Eyes in life without stripes
..... *sparus sparus* Whitney
- b. Eyes in life with a single purple stripe
..... *sparus milleri* Whitney
- 36.(28)a. Pale spot on second abdominal segment much smaller than those on third and fourth segments, or absent
..... 37
- b. Pale spot on second abdominal segment not markedly smaller than those on two following segments
..... 40
- 37. a. Abdomen blackish with large white triangles not arising from bands on third to fifth segments; fore tibia bicolored
..... *trimaculatus* Palisot de Beauvois
- b. Not with this combination of characteristics; all tibiae dark reddish brown
..... 38
- 38. a. Abdominal median triangles very small, not arising from bands; scutellum concolorous with thorax; area of large eye facets occupying about half of total eye area and sharply demarcated
..... *superjumentarius* Whitney
- b. Abdominal triangles moderate size, often arising from bands; scutellum white pollinose; contrasting with dark thorax; area of large facets occupying about $2/3$ of total area but not sharply demarcated
..... 39
- 39. a. Face and cheeks gray pollinose; abdominal stripes arise from pale bands which may cover basal half of third and fourth segments; venter with wide gray bands
..... *molestus molestus* Say
- b. Face and cheeks mostly brown pollinose; abdominal bands if present very narrow on dorsum and venter
..... *molestus mixus* Philip
- 40.(36)a. No spot at bifurcation
..... 41
- b. Bifurcation with a conspicuous spot [Contrasting marked species; abdominal triangles arising from bands]
..... 45

41. a. Large and small eye facets differ very little in size, not separated by a distinct line of demarcation; large species with very small median triangles and dark yellow legs and antennae
 *calens* Linnaeus
 b. Large eye facets distinctly set off from small facets; third antennal segment at least partly dark; size variable
 42
42. a. Large species (over 20mm) with femora orange-brown or chestnut brown; first posterior cell not narrowed at wing base; excision of third antennal segment deep
 43
 b. Smaller species (under 20mm) with dark femora and paler tibiae; first posterior cell narrowed or closed at wing margin; excision of third antennal segment moderate
 44
43. a. Legs almost uniformly brown, tarsi somewhat darker; genae brown; second palpal segment brown; abdomen uniformly dark brown with small median triangles
 *catenatus* Walker
 b. Middle and hind tibiae and base of fore tibiae paler than femora; second palpal segment yellow brown; abdomen reddish brown laterally with median triangles on narrow black stripe
 *novaescotiae* Macquart
44. a. Median triangle crosses second abdominal segment; hind tibiae usually completely pale; large facets occupy about half of total area of compound eye
 *petiolatus* Hine
 b. Median triangle does not cross second abdominal segment; hind tibiae darkened at apex; large facets occupy about 2/3 of total area of compound eye
 *melanocerus* Wiedemann
- 45.(40)a. Legs rather uniformly yellowish to dark brown and fore tibiae not paler at base; antennae very slender; basal plate at least twice as long as its greatest width, narrower than height of first antennal segment and equal in length to annulate portion; larger species (over 20mm)
 *turbidus* Wiedemann
 b. Legs with femora darker than tibiae and fore tibiae paler at base
 46
46. a. Pale median abdominal triangles conspicuous; middle femora often brownish; wing membrane lightly tinted
 *sulcifrons* Macquart
 b. Pale median abdominal triangles obsolete but with heavy median black spots; all femora deep black; wing heavily tinted, especially anteriorly
 *abdominalis* (in part) Fabricius

Tabanus abdominalis Fabricius

There is some confusion about the identity of this species, which belongs to the *abdominalis-sulcifrons* complex. According to Pechuman (1954), *T. abdominalis* approaches *T. sulcifrons* but has a very narrow frons, closed posterior cell, no abdominal triangles, and wholly black femora. Among the surrounding states, it has been reported from PA, VA, KY, and elsewhere from NE to MA, south to TX and FL. The complex is in need of revision, and older records should be confirmed. *T. abdominalis* should occur in West Virginia but has not yet been found.

Tabanus americanus Forster

Seasonal Range—11-VII to 5-IX (21-VI to X).
Distribution—BERKELEY, Arden, 5-IX-78, KM, WVU. FAYETTE, New River, 2-VIII-76, JM, WVU. HAMPSHIRE, Grace, 14-VII-77, CC, WVDA. MERCER, Bluefield, 13-VIII-78, JWB, WVU. MINGO, 5 mi. N. Williamson, 19-VII-76, BD, WVU. NICHOLAS, Rd. to Cranberry Campground, 11-VII-76, BD, WVU.

This is the largest of the Tabanidae, but fortunately for livestock it does not occur in large numbers. These large blood feeders were observed to fly slowly and often alight or attempt to alight on man, the sides of a gold colored truck, and a large black raft traveling down the New River. *T. americanus* occurs in all of the contiguous states and probably throughout West Virginia.

Tabanus aranti Hays

This species has been collected in VA, PA, and TN. *T. aranti* is not easily distinguished from *T. colon* (originally described by Stone as *T. atripennis* and placed as a variety of *T. nigrescens*), which now appears to be a more western species. All of Stone's eastern specimens studied by Pechuman and Fairchild are *aranti* (pers. com., Pechuman). It has not been reported from West Virginia.

Tabanus atratus atratus Fabricius

Seasonal Range—26-V to 16-IX (14-IV to 2-XII).
Distribution—BERKELEY, 7-VIII-77, RD, WVU. FAYETTE, Rainelle, 1-VIII-77, TK, WVU. HAMPSHIRE, Grace, 8-VI-76, WN and KE, WVDA. HARDY, 3-VIII-66, RM, WVU. MONONGALIA, Morgantown, 29-VIII-72, LB, WVU. MONROE, Wayside, 15-VIII-77, JWB, JWB. PRESTON, Arthurdale, 26-VIII-78, RS, WVU.

This species is nearly as large as *T. americanus* but is completely black (sometimes with a bluish tint on the abdomen). It should occur throughout the state in low numbers and has been found in all of the contiguous states.

Tabanus calens Linnaeus

Seasonal Range—3-VIII to 16-IX (19-VII to 1-X).
Distribution—BERKELEY, Sleepy Creek Publ.

Hunt. and Fish. Area, 3-VIII-75, BD, WVU. BRAXTON, Kanawha Run-Sutton Lk., 10-VIII-78, LB, WVU. CABELL, Nine Mile Rd., 13-VIII-76, BD, WVU. HAMPSHIRE, Capon Bridge, 31-VII-75, PV, WVDA. JEFFERSON, Shannondale, 2-VIII-77, JH, WVDA. LINCOLN, Big Ugly Publ. Hunt. Area, 2-VIII-78, LB, WVU. MINERAL, N. Hanks Mem., 16-VIII-77, LB, WVU. SUMMERS, Pipestem St. Pk., 16-IX-75, JH, WVDA. WETZEL, 2-IX-73, FP, WVU.

This late season species is widely distributed in small numbers in West Virginia and in the surrounding states.

Tabanus catenatus Walker

Seasonal Range—7-VIII to 12-VIII, (17-VI to 12-X).
Distribution—MONONGALIA, 12-VIII, WVU. MONROE, Hollywood, 7-VIII-77, JH, WVDA ("BLT").

This species is not numerous throughout its range. Of the contiguous states, a few records are known from MD, PA, and VA.

Tabanus cymatophorus Osten Sacken

Seasonal Range—4-VIII ("July").
Distribution—HAMPSHIRE, Grace, 4-VIII-77, CC, WVDA, and LLP.

This is a very local species not commonly encountered. It is also known from MD and KY, the former being a single county record.

Tabanus fairchildi Stone

Seasonal Range—26-V to 13-VIII.
Distribution—BROOKE, Bethany, 10-VII-75, JH, WVDA. CABELL, Nine Mile Rd., 13-VIII-76, BD, WVU. HAMPSHIRE, Grace, 26-V-77, CC, WVDA. WETZEL, Lewis Wetzel Publ. Hunt. Area, BD, WVU.

Philips' catalog (1947) reported this species from all of the neighboring states, and it should occur throughout West Virginia in low numbers.

Tabanus fulvulus Wiedemann

Seasonal Range—15-VI to 8-VIII (4-VI).
Distribution—BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 2-VIII-75, BD, WVU. HAMPSHIRE, Capon Bridge, 15-VI-76, WN and KE, WVDA. HARDY, Warden Lk., 24-VII-76, BD, WVU. MINERAL, New Creek, 25-VI-76, BD, WVU. MORGAN, Cherry Run, 17-VII-78, CC, WVDA. PENDLETON, Ft. Seybert, 15-VII-76, WN and KE, WVDA. Lewis Wetzel Publ. Hunt. Area, 18-VI-76, BD, WVU.

West Virginia records are among the northernmost reports for *T. fulvulus*, which occurs south of a line from PA to OK. It is found primarily at lower elevations in the state, characteristic of southern species at their northern range limits.

Tabanus fuscicostatus Hine

Of the contiguous states, only two specimens are known from VA and KY. This species is primarily

southern and possibly occurs in southern West Virginia.

Tabanus gladiator Stone

This species is not common, especially in this area. It is not known to occur north of MD, and its southern range spans from eastern TX to FL.

Tabanus lineola Fabricius

Seasonal Range—12-VI to 14-VIII (31-V to 31-VIII). Distribution—BARBOUR, 8-VII-75, BD, WVU. BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 2-VIII-75, BD, WVU. BRAXTON, Sutton Lk., 8-VII-75, BD, WVU. HAMPSHIRE, Grace, 7-VII-76, WN and KE, WVDA. HARDY, Warden Lk., 24-VII-76, BD, WVU. KANAWHA, St. Albans, 8-VII-77, JH, WVDA. LEWIS, Jackson's Mill, 28-VII-75, JH, WVDA. MASON, McClintic Wildlife Sta., 7-VII-77, JH, WVDA. MONONGALIA, WVU Animal Husbandry Farm, 2-VII-75, BD, WVU. MONROE, Rt. 219, 12-VIII-75, BD, WVU. NICHOLAS, Craig, 12-VI-70, JH, WVDA. PRESTON, Reedsville Exp. Sta., 24-VII-75, BD, WVU. RANDOLPH, Gilman, 29-VI-76, PV, WVDA. RITCHIE, N. Bend St. Pk., 23-VI-78, JH, WVDA. SUMMERS, Pipestem St. Pk., 28-VII-76, TM, WVU. UPSHUR, Stonecoal, 27-VI-77, PV, WVDA. WETZEL, Lewis Wetzel Publ. Hunt. Area, 18-VI-76, BD, WVU.

This species is known from all surrounding states and becomes quite numerous at times, especially in June and July. Specimens from West Virginia are all of the melanistic, narrow-fronted form, distinct from the *lineola* of the coast (Pechuman and Burton, 1969).

Tabanus longiusculus Hine

The northernmost record was taken in MD. No other records of this southern species are known from surrounding states. It may be present in West Virginia.

Tabanus longus Osten Sacken

Seasonal Range—6-VII to 14-IX (2-VII). Distribution—"West Va." 1933, det. Fairchild, HU. BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 2-VIII-75, BD, WVU. HAMPSHIRE, Capon Bridge, 24-VII-75, CC, WVDA. HARDY, Warden Lk., 24-VII-76, LB and BD, WVU. MORGAN, Cacapon St. Pk., 2-VIII-75, BD, WVU.

T. longus has been considered rare in its known range (PA south to TX and GA). This study, however, has produced more specimens and longer series than have been previously known to Pechuman. In fact, at BERKELEY (2-VIII-75) this species made up 30 percent of the *Tabanus* collected. Black light traps were also a successful collection method for *Tabanus* there, and half of the *Tabanus* collected were *T. longus* females. This is the first record of *T. longus* attracted to UV light. Male *T. longus* are unknown, and intensive collecting in the BERKELEY county area failed to produce specimens. However, many male and female specimens of the superficially similar *T. sackeni* were captured. *T. longus* records seem to be restricted to the

northeastern part of West Virginia, but it is known from all of the neighboring states.

Tabanus marginalis Fabricius

Seasonal Range—1-VI to 29-VII (1-V). Distribution—HANCOCK, Tomlinson Run St. Pk., 9-VI-76, JA, WVU. POCAHONTAS, Bartow, 27-VI-77, LB, WVU. PRESTON, Cranesville Swamp, 12-VI-65, PT, PT. RANDOLPH, Gilman, 1-VI-76, PV, WVDA. UPSHUR, Stonecoal Lk., 27-VI-77, PV, WVDA.

This is a northern species, which has been reported from PA, OH, and MD. Disjunct populations are also known from mountainous areas and swamps as far south as NC.

Tabanus melanocerus Wiedemann

This species occurs in MD, KY, PA, and in VA counties very close to West Virginia's easternmost and southernmost border lines. It is not considered a common species but may become locally abundant.

Tabanus molestus molestus Say

Seasonal Range—15-VI to 17-VIII (9-VI to 1-IX). Distribution—HAMPSHIRE, Capon Bridge, 16-VII-75, PV, WVDA. HARDY, Moorefield, 17-VIII-76, WN, WVDA. KANAWHA, St. Albans, 15-VI-78, JH, WVDA. McDOWELL, Panther St. For., 10-VII-77, LB, WVU. WEBSTER, Summer 78, DF, WVU.

This species is not numerous in West Virginia but has an extensive distribution from WI to NJ southward to TX and FL.

Tabanus molestus mixus Philip

This is a southern species known as far north as KY, VA, and MD. It should occur in West Virginia at lower elevations. The taxonomic status of this dark form of *T. molestus* is uncertain; it may prove to be a separate species.

Tabanus mularis Stone

This is another southern species which seems to find its northernmost range east of the Appalachian Mountains in MD. Additional records from VA and KY suggest the possible occurrence of *T. mularis* at lower elevations of West Virginia.

Tabanus nigrescens Palisot de Beauvois

Seasonal Range—6-VII to 30-VII (22-VI to 12-VIII). Distribution—HAMPSHIRE, Grace, 21-VII-77, CC, WVDA. HARDY, Warden Lk., 24-VII-76, LB, BD and PF, WVU. MINERAL, Junction, 6-VII-76, WN and KE, WVDA. MONONGALIA, WVU Animal Husbandry Farm, 7-VII-75, BD, WVU. LEWIS, Jackson's Mill, 30-VII-75, JH, WVDA.

This species is probably more common in the state than records now depict, although large populations most likely will not be found. It is known from all of the states contiguous to West Virginia.

Tabanus nigripes Wiedemann

Seasonal Range—10-VI to 16-VIII (5-VI). Distribution—BERKELEY, Sleepy Creek Publ.

Hunt. and Fish. Area, 2-VIII-75, BD, WVU. GRANT, Petersburg, 2-VI-75, JH, WVDA. HAMPSHIRE, Grace, 30-VI-77, CC, WVDA. HARDY, Old Fields, 6-VII-76, KE and WN, WVDA. JEFFERSON, Shannondale, 2-VIII-77, JH, WVDA. MASON, McClintic Wildlife Sta., 7-VII-77, JH, WVDA. MINERAL, New Creek, 25-VI-76, BD, WVU. MONONGALIA, WVU Animal Husbandry Farm, 2-VII-75, BD, WVU. NICHOLAS, 20-VI-75, BD, WVU. PRESTON, Cranesville Swamp, 10-VI-77, HT, HT. RANDOLPH, 16-VIII-76, PV, WVDA (specimen in poor condition). SUMMERS, Pipestem St. Pk., 28-VI-77, JH, WVDA.

This *Tabanus* is widely distributed throughout eastern North America but is not reported to be abundant. It should occur throughout West Virginia.

Tabanus novaescotiae Macquart

Seasonal Range—10-VIII to 10-IX

Distribution—POCAHONTAS, Cranberry Glades, 10-VIII-52, HW, USNM. RANDOLPH, 10-IX-76, PV, WVDA.

This is a northern species also known from VA. Philip (1947) published records from MD and DC under the synonym *T. actaeon*. However, Thompson (1967a, b) believes these MD and DC records actually refer to *T. catenatus*. The West Virginia specimens represent disjunct populations. In 1974 Burger collected the first *T. novaescotiae* larvae from sphagnum at Cranberry Glades and reared them to adults (Teskey and Burger, 1976).

Tabanus pallidescens Philip

Seasonal Range—I-VI to 28-VII (18-VIII).

Distribution—BRAXTON, Sutton Lk., 8-VII-75, BD, WVU. KANAWHA, St. Albans, 1-VI-78, JH, WVDA. RITCHIE, N. Bend St. Pk., 23-VI-78, JH, WVDA. SUMMERS, Pipestem St. Pk., 28-VII-76, TM, WVU. WETZEL, Lewis Wetzel Publ. Hunt. Area, 18-VI-76, BD and RL, WVU.

This is a southern horse fly reported as far north as NJ and MO. In West Virginia it is probably widely distributed but is not common.

Tabanus petiolatus Hine

This is another southeastern species, occurring from TX to FL and north to NJ along the coast. Inland records from MD and VA suggest that it may occur in West Virginia.

Tabanus proximus Walker

This is a very late season species (I-IX to 3-X), and is recorded as far north as OH, MD, VA, and KY. It is not often encountered in its northern range but may occur in West Virginia at lower elevations.

Tabanus pumilus Macquart

Seasonal Range—25-V to 28-VII (11-V to 15-VIII).

Distribution—BERKELEY, Allansville, 25-V-77, CC, WVDA. BROOKE, Bethany, 10-VII-75, JH, WVDA. GRANT, Mt. Storm, 20-VI, WVU. GREENBRIER, Clendinsville, 18-VI-76, JH, WVDA. HAMPSHIRE,

23-VI-76, PV, WVDA. KANAWHA, St. Albans, 17-VI-77, JH, WVDA. MASON, McClintic Wildlife Sta., 7-VII-77, JH, WVDA. MINERAL, New Creek, 11-VI-76, BD, WVU. MONONGALIA, Dent's Run, 17-VI-76, BD, WVU. OHIO, Bear Rocks Lk., 25-V-76, JH, WVDA. PRESTON, Arthurdale, 12-VI-78, PS, WVU. RANDOLPH, Gilman, 12-VI-76, PV, WVDA. RITCHIE, North Bend St. Pk., 22-VI-77, LB, WVU. SUMMERS, PIPESTEM St. Pk., 14-VI-75, BD, WVU.

T. pumilus is widely distributed in West Virginia and the surrounding states. It is similar to *T. sparus milleri* in habits but is not quite as abundant.

Tabanus quinquevittatus Wiedemann

Seasonal Range—17-V to 10-IX; most common in VI and VII.

Distribution—BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 25-VII-76, BD, WVU. BRAXTON, Kanawha Run-Sutton Lk., 16-VIII-78, LB, WVU. BROOKE, Bethany, 10-VII-75, JH, WVDA. GILMER, Cedar Ck. St. Pk., 4-VI-77, LB, WVU. GRANT, Petersburg, 2-VII-75, JH, WVDA. HAMPSHIRE, 2 mi. E. Capon Bridge, 3-VII-75, BD, WVU. HARDY, Warden Lk., 24-VII-76, LB and BD, WVU. JACKSON, Millwood, 22-VII-75, JH, WVDA. JEFFERSON, 10-VI-77, RD, WVU. KANAWHA, St. Albans, 10-VII-77, JH, WVDA. LEWIS, Jackson's Mill, 28-VII-75, JH, WVDA. LINCOLN, Garrets Bend, 12-VII-77, KH, WVDA. MARSHALL, Dallas, 6-VIII-76, GL, WVDA. MASON, McClintic Wildlife Sta., 7-VII-77, JH, WVDA. MERCER, Bluefield, 31-VII-77, JWB, JWB. MINERAL, New Creek, 11-VI-76, BD, WVU. MONONGALIA, WVU Animal Husbandry Farm, 2-VII-75, BD, WVU. MONROE, Rt. 219, 11-VIII-75, BD, WVU. MORGAN, Cherry Run, 5-VII-78, CC, WVDA. OHIO, Bear Rocks Lk., 17-VIII-77, JH, WVDA. PENDLETON, German Valley, 16-VII-75, JH, WVDA. PRESTON, Reedsville Exp. Sta., 10-VII-75, CS. RANDOLPH, Gilman, 22-VI-76, PV, WVDA. RITCHIE, N. Bend St. Pk., 23-VI-78, JH, WVDA. UPSHUR, Buckhannon, 12-VI-76, JH, WVDA. WETZEL, Lewis Wetzel Publ. Hunt. Area, 18-VI-76, BD, WVU.

T. quinquevittatus and *T. nigrovittatus*, its close relative in the coastal salt-marsh area, are known commonly as "green-heads." This species was reported from all of the surrounding states by Philip (1947), and it has been taken from all of West Virginia's geographic zones, being most abundant in the Eastern Panhandle. *T. quinquevittatus* is one of the more important pests of livestock in the state and is able to build up in high numbers. While most tabanid larvae are restricted to substrates in or adjacent to bodies of water, larvae of this species have been collected from low-lying areas in cultivated fields and pastures. Thus, this species has acquired a much larger breeding area.

Tashiro and Schwardt (1953b) estimated that 19,360 potential blood feeding females could emerge from one acre of suitable breeding area. Females prefer feeding on the paunch, dewlap, and udder of cattle (Blickle, 1955) and they will readily attack people (Thompson 1967a, 1969).

Tabanus reinwardtii Wiedemann

Seasonal Range—27-VI to 9-VII (28-V to 26-VIII). Distribution—GREENBRIER, Greenbrier St. For., 9-VII-77, LB, WVU. HARDY, Moorefield, 30-VI-77, JH, WVDA. MONONGALIA, WVU Hort. Farm (found dead in a greenhouse), IX-75, BD, WVU.

T. reinwardtii adults are not commonly collected, although the larvae are relatively common. This species has been reported from all of the contiguous states and is probably evenly distributed throughout West Virginia.

Tabanus sackeni Fairchild

Seasonal Range—24-VI to I-X (17-VI); most common in VIII.

Distribution—BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 2-VIII-75, BD, WVU. BRAXTON, Kanawha Run-Sutton Lk., 16-VIII-78, LB, WVU. BROOKE, Wellsburg, 7-VIII-77, RL, WVU. CABELL, Nine Mile Rd., 13-VIII-76, BD, WVU. GRANT, Greenland, 27-VII-78, CC, WVDA. GREENBRIER, Greenbrier St. For., 27-VIII-78, LB, WVU. HAMPSHIRE, Capon Bridge, 24-VI-75, CC, WVDA. HANCOCK, Chester, 15-VIII-78, JH, WVDA. HARDY, Lost River St. Pk., 23-VIII-56, KK, KK. JEFFERSON, Shannondale, 3-VIII-78, CC, WVDA. LEWIS, Jackson's Mill, 26-VII-77, JH, WVDA. LINCOLN, Big Ugly Publ. Hunt. Area, 2-VIII-78, LB, WVU. MARION, Bunner's Ridge, 4-VIII-77, LB, WVU. MARSHALL, Girl Scout Camp, 6-VIII-77, GL, WVU. MASON, Chief Cornstalk Publ. Hunt. Area, 2-VIII-78, LB, WVU. MINERAL, Junction, 27-VII-76, WN and KE, WVDA. MONONGALIA, WVU Hort. Farm, 21-VII-75, LB, WVU. MORGAN, Orleans Cross Roads, 7-IX-72, JB, JB. NICHOLAS, Summersville, 4-VII-70, JH, WVDA. OHIO, Wheeling, 14-VIII-74, JW, WVDA. PENDLETON, Ft. Seybert, 29-VII-76, WN and KE, WVDA. POCAHONTAS, Boyer, 5-VIII-76, WN and KE, WVDA. PUTNAM, Hurricane, 11-VIII-77, JH, WVDA. RANDOLPH, 10-IX-76, PV, WVDA. SUMMERS, Pipestem St. Pk., 13-VIII-75, JH, WVDA. WOOD, 26-VII-75, BD, WVU. WEBSTER, 8-VIII-78, DF, WVU. WETZEL, Proctor District, 25-VII-75, EE, EE.

This abundant species may be the most important pest during the later part of the season. It is found throughout West Virginia and contiguous states. Adults have crepuscular and nocturnal habits, both sexes being readily attracted to black light traps.

Tabanus sagax Osten Sacken

Seasonal Range—23-VII to 2-VIII (27-VI).

Distribution—BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 2-VIII-75, BD, WVU.

This fly is not often collected, but is widely distributed in the eastern United States. Further collecting in the lower western areas of the state may produce more specimens.

Tabanus similis Macquart

Seasonal Range—28-V to 9-VIII.

Distribution—HAMPSHIRE, Grace, 23-VI-76, WN and KE, WVDA. MINERAL, New Creek, 25-VI-76, BD, WVU. MONONGALIA, Dent's Run, 28-V-75, BD, WVU. NICHOLAS, 2-VI-70, JH, WVDA. PENDLETON, Seneca Campground, 23-VI-76, BD, WVU. PRESTON, Eglon, 1-VII-75, RW, WVU. RANDOLPH, Gilman, 12-VI-76, PV, WVDA. SUMMERS, Pipestem St. Pk., 14-VI-76, BD, WVU.

Pechuman (1973) states that the southern limit of this species in eastern U.S. occurs in VA and KY. It is widespread in West Virginia, seemingly restricted to the hilly and mountainous regions.

Tabanus sparus sparus Whitney

This species may be numerous in some localities, but it has a spotty distribution. It is known from PA, MD, VA, NC, and IN, and may eventually be found in West Virginia.

Tabanus sparus milleri Whitney

Seasonal Range—26-V to 29-VIII (15-V)

Distribution—BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 2-VIII-75, BD, WVU. GRANT, Greenland, 13-VII-78, CC, WVDA. HAMPSHIRE, Capon Bridge, 25-VI-75, CC, WVDA. HARDY, Lost River St. Pk., 6-VII-55, KK, KK. KANAWHA, St. Albans, 5-VI-76, JH, WVDA. MASON, McClellin Wildlife Sta., 7-VII-77, JH, WVDA. MINERAL, New Creek, 11-VI-76, BD, WVU. MONONGALIA, WVU Animal Husbandry Farm, 7-VII-75, BD, WVU. MORGAN, Cherry Run, 13-VI-78, CC, WVDA. PENDLETON, Ft. Seybert, 22-VII-76, WN and KE, WVDA. RITCHIE, N. Bend St. Pk., 23-VI-78, JH, WVDA. SUMMERS, Pipestem St. Pk., 28-VI-77, JH, WVDA. WOOD, 17-VI-75, TM, WVU.

This is the more common of the two forms of *T. sparus*, and has been collected in all of the neighboring states. Most of the records are from the Eastern Panhandle, where it seems to be more numerous. It attacks man readily in much the same manner as do aggressive *Chrysops*. It also occurs in large numbers and is thus considered to be the most annoying of the synanthropic horse flies.

Tabanus stygius Say

This tabanid is not commonly collected, but it has a wide distribution covering the eastern United States. Having been recorded in all of the neighboring states except KY, it will probably be found in West Virginia.

Tabanus sublongus Stone

Seasonal Range—1-VIII to 9-IX.

Distribution—HARDY, Lost River St. Pk., 22-VIII-

56, KK, KK and LLP. HAMPSHIRE, Capon Bridge, 13-VIII-75, PV, WVDA. MORGAN, Orleans Cross Roads, 7-IX-72, JB, JB.

T. sublongus records are restricted to the eastern side of the Appalachians in West Virginia. However, it has been collected in OH, KY and, in the south, it has been reported as far west as OK.

Tabanus subniger Coquillett

This species has been found primarily north of the state, but it has been reported from PA and OH counties very close to the northern tips of West Virginia's Eastern and Northern Panhandles. This tabanid is rare throughout its range but probably occurs within the state's borders.

Tabanus subsimilis subsimilis Bellardi

Seasonal Range—14-V to 14-IX.

Distribution—BERKELEY, Arden, 29-VII-78, KM, WVU. BROOKE, Bethany, 10-VII-75, JH, WVDA. HAMPSHIRE, Grace, 4-VIII-76, WN and KE, WVDA. HANCOCK, Newell, 7-VIII-77, RL, WVU. HARDY, Moorefield, 4-VII-76, BD, WVU. MINERAL, New Creek, 11-VI-76, BD, WVU. MONONGALIA, Morgantown, 18-VIII-72, LB, WVU. MONROE, Hollywood, 30-VIII-76, EB, WVDA. NICHOLAS, Summersville, 4-VII-70, JH, WVDA. PENDLETON, 4-IX-77, JV, WVU. PRESTON, Cranesville Swamp, 18-VIII-76, BD, WVU. RANDOLPH, Elkins, 20-VIII-68, WF, WF. WETZEL, Lewis Wetzel Publ. Hunt. Area, 18-VI-76, BD, WVU. WOOD, 16-VI-71, LB, WVU.

T. subsimilis is widely distributed but not very abundant in West Virginia. This species responds well to black light traps, suggesting crepuscular or nocturnal behavior.

Tabanus sulcifrons Macquart

Seasonal Range—4-VII to 26-X (10-VI); most common in VII and VIII.

Distribution—BERKELEY, Sleepy Creek Publ. Hunt. and Fish. Area, 2-VIII-75, BD, WVU. HAMPSHIRE, Capon Bridge, 13-VIII-75, PV, WVDA. HARDY, Lost River St. Pk., 22-VIII-56, KK, KK. JACKSON, Millwood, 22-VII-75, JH, WVDA. JEFFERSON, Kearneysville, 26-X-76, RB, WVU. KANAWHA, Charleston, 20-VII-75, CP, WVU. LEWIS, Jackson's Mill, 28-VII-75, JH, WVDA. LINCOLN, Garrets Bend, 16-VIII-77, KH, WVDA. MASON, McClintic Wildlife Sta., 7-VII-77, JH, WVDA. MONONGALIA, Cooper's Rock, 20-VII-59, JHH, WVU. MONROE, Near Wayside, 26-VII-76, TM, WVU. PRESTON, Little Laurel Run, 2-VIII-77, JA, WVU. RITCHIE, Cairo, 1930, JCB, CU. ROANE, Spencer, 4-VII-75, RJ, CU. SUMMERS, Pipestem St. Pk., 13-VIII-75, JH, WVDA. TAYLOR,

Grafton, 29-VII-51, CM. WETZEL, Proctor District, 25-VII-75, EE, EE. WIRT, Craig, 2-VIII-69, JH, WVDA. WOOD, 26-VII-75, PC, WVU.

This species comprises part of the *sulcifrons-abdominalis* complex, which is in need of revision. Material now described as *T. sulcifrons* may actually represent several species, and distribution records may be altered in the future. *T. sulcifrons* occurs throughout the eastern United States. Although *T. sulcifrons* is not as numerous as some of the common smaller tabanids, its large size should be taken into consideration when evaluating its importance to livestock. It has a noisy approach that tends to frighten animals, and when it bites, it takes much blood (0.34 cc) and leaves large punctures (Tashiro and Schwardt, 1953). Immatures, like those of *T. quinquevittatus*, can survive in dry soil, which accounts for its abundance and wide distribution.

Tabanus superjumentarius Whitney

Seasonal Range—5-VI to 12-VIII (5-V).

Distribution—BROOKE, Bethany, 10-VII-75, JH, WVDA. KANAWHA, St. Albans, 5-VI-77, JH, WVDA. MASON, McClintic Wildlife Sta., 7-VII-77, JH, WVDA. MONONGALIA, 5 mi. S. Core, 16-VI-76, BD, WVU. RANDOLPH, Gilman, 29-VI-76, PV, WVDA. RITCHIE, N. Bend St. Pk., 23-VI-78, JH, WVDA. SUMMERS, Pipestem St. Pk., 28-VI-77, JH, WVDA. WEBSTER, Cranberry Campground, 11-VII-76, BD, WVU. WETZEL, Lewis Wetzel Publ. Hunt. Area, 18-VI-76, BD, WVU.

Although this species is not reported from KY, it occurs in all of the other neighboring states. In West Virginia, it has not been collected in the Eastern Panhandle, but it should occur there.

Tabanus trimaculatus Palisot de Beauvois

Seasonal Range—8-VI to 4-VIII (15-V to 18-VIII).

Distribution—HAMPSHIRE, Grace, 4-VIII-76, WN and KE, WVDA. HARDY, 2 mi. S. Moorefield, 4-VII-77, LB, WVU. MASON, McClintic Wildlife Sta., 7-VII-77, JH, WVDA. MONONGALIA, Joe's Run, 8-VI-76, LB, WVU. PENDLETON, Seneca Campground, 23-VI-76, BD, WVU. RANDOLPH, Gilman, 15-VI-76, PV, WVDA.

This attractive tabanid may become locally abundant. It should be found throughout West Virginia as it has been reported from all of the surrounding states.

Tabanus turbidus Wiedemann

This is another southern tabanid which may occur in the state. The type specimen was collected in KY, and it ranges from extreme south to LA and FL. No records have been reported from other states contiguous to West Virginia.

Tabanus venustus Osten Sacken

This species is considered rare within its range. Pechuman knows of specimens from western OH and

central KY, leading one to suspect its occurrence in West Virginia.

Tabanus vivax Osten Sacken

Seasonal Range—10-VI to 18-VIII

Distribution—POCAHONTAS, Cranberry Glades, 15-VIII-52, HW, USNM. PRESTON, Cranesville Swamp, 18-VIII-76, BD, WVU. WEBSTER, Cranberry Campground, 20-VI-75, BD, WVU.

This species is not commonly collected, and West Virginia's mountains mark the southern extreme of its

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